OCTOBER 25 CENTS

POPULAR MECHANICS

MAGAZINE

SEP 9 1929

WRITTEN SO YOU CAN UNDERSTAND IT

SEE PAGE 573

NEWS *for the owners of*

Hupmobile
Auburn 8
Graham-Paige
Buick
Nash

We have proved in thousands of miles of test driving on highways and the Atlantic City Speedway, and in hundreds of laboratory tests, that the New Mobiloil "BB" gives the greatest summer protection and power with the lowest oil consumption to Buick (1929, 1928, 1927 models), Nash (Advanced and Special Six 1929, 1928, 1927 models), Hupmobile (All 1929 and 1928 models), Graham-Paige (All 1929 and 1928 models), and Auburn 8's (1929, 1928, 1927 models). If you own one of these cars remember to *ask for Mobiloil "BB."* The price is 35¢ a quart, and there is always a Mobiloil dealer nearby.

VACUUM OIL COMPANY

Makers of high-quality lubricants for all types of machinery

the new GARGOYLE

Mobiloil "BB"

Popular Mechanics Magazine

200 E. Ontario Street, Chicago, U. S. A.

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2½ Tons Heats 6 Rooms!

"With our Bulldog Furnace we use about 2½ tons of coal a winter on the average, and it is cozy all the time. We have only a 6-room house so we just use a third of the grate. Three cheers for the 'Bulldog'!"
Frank H. Taylor, Dunning, Nebr.

Fuel Saved Pays for Furnace
"This is the second winter I have used the Bulldog and the savings in my coal bills have paid for my furnace!"—Milton E. Spain, Casey, Ia.

After 6 Years—"Heats as Good as Ever"
"Our furnace has been in use 6 years and heats as good as ever."—Arthur Cloepfil, R. F. D. No. 1, Rock Fort, Mo.

Does the Work of 3 Stoves
"This is my third winter with the Bulldog. It does the work of 3 coal stoves, which only warmed up part of the house and not very well at that. My Bulldog not only does that, but also 3 rooms upstairs, with great satisfaction. My house is located in a very cold place, with no protection at all."—Edwin C. Diplock, 106 Elm Street, Camden, Maine.

No Money Down!

Small Monthly Payments—Installed Almost as Easily as a Cook Stove!

The Bulldog is sent to you for *free inspection*. Then, if satisfied, you make only small monthly payments at our remarkably low price. Write today! *Don't* miss this chance to cut down your fuel bills! *Install a Bulldog Furnace!* It comes to you completely erected—goes through any door—fits any height of basement—and you install it yourself in less than two hours! **In fact, you can install the Bulldog just about as easily as a kitchen cook stove.** *Don't* put up with the old fashioned stove heat or some outworn furnace—when you can so easily get the greatest advance in scientific heating at an astonishingly low price. The Bulldog burns almost any kind of fuel, from hard coal to cheap screenings. Keeps a wood fire over night. **We have factory connections in both east and west and ship from the nearest point.**

Send for Free Book!

Learn how to have all the heat you want—where you want it—and save money! Remember the Bulldog is *different*—and *better!* Complete combustion of gases save 25% of your fuel bill. Exclusive Gable-Top Radiator receives *all* the direct rays of the fire. Exclusive oblong fire-pot is not only ideal for coal, but enables you to keep a wood fire over night. Remember—the Bulldog is sent for *free inspection*—then small monthly payments at an amazingly low price!—Send for Free Book TODAY!

Bulldog Furnace Co., 19th and California Avenue, Dept. 13-57 Chicago, Ill.

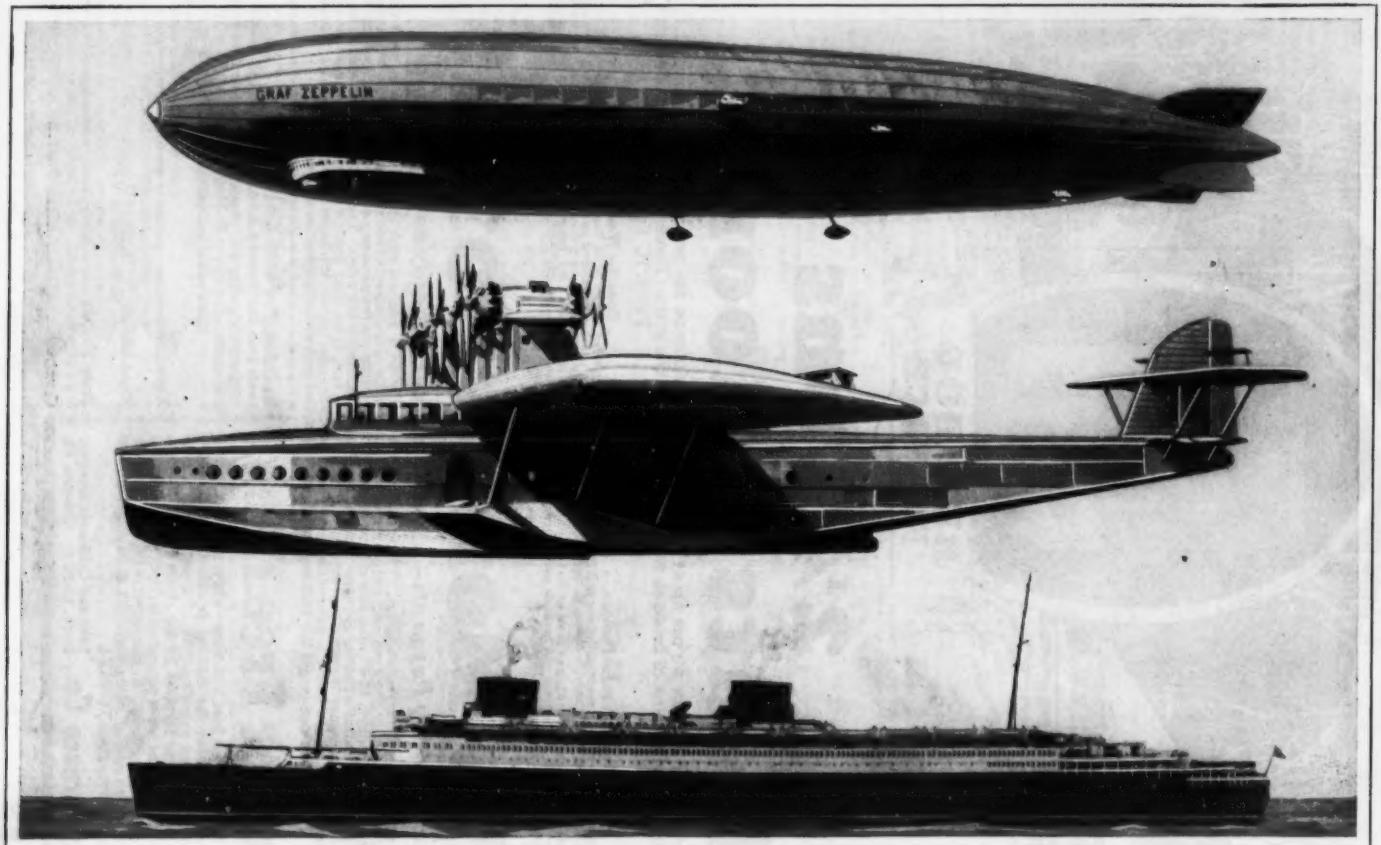
Bulldog Furnace Co.,
19th and California Ave., Dept. 13-57, Chicago
Without obligating me, please send me your free catalog and special offer on the Bulldog Furnace.
Have you a basement? *Yes* ☐ *No* ☐

Name.....

Street Address.....

Town.....

County..... *State*.....



Germany's Peace-Time Triumphs of the Air and Sea; the "Graf Zeppelin," the Big 100-Passenger Dornier Seaplane, Propelled by Twelve Motors, and the Steamship "Bremen," Breaker of Ocean Speed Records; These Three Huge Units Promise a Complete Change in the Picture of International Transportation

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Planes Aid Fire Fighters

By K. M. PAINTER

A VOICE thundering advertisements from the skies suggested the possibility of using a loud speaker in fire-patrol planes to direct the ground forces in their war on forest fires.

When the great fire swept over the Sierra Madre mountains a few years ago, fire fighting was directed from the city hall, and many hours elapsed before an order could be taken to the men at the front.

Now, by using an airplane equipped with a loud speaker, an order can be given directly to the fire fighters. With such an airplane to patrol the fire front, the men can be kept working at greater advantage and out of zones of danger.

At the close of the World War, the

Germany's Peace-Time Triumphs on the Air and Sea; the "Graf Zeppelin," the Big 100-Passenger Dornier Seaplane, Propelled by Twelve Motors, and the Steamship "Bremen," Breaker of Ocean Speed Records; These Three Huge Units Promise a Complete Change in the Picture of International Transportation

army co-operated with the forestry service and established an aerial patrol system. During the first four years of patrol work, definite routes were followed, varying from 200 to 500 miles in length. Each plane was equipped with a radio sending set. The ground stations were so located that when a plane passed from the receiving range of one station, it went within the radius of another. By this means all new fires discovered, and the status of old fires, could be reported immediately.

A pilot and observer were in every plane. The pilot attended exclusively to the flying duties, while the observer confined his attention to finding and reporting fires. To adequately cover the territory assigned to a route required four to six hours, depending upon the number of fires discovered. And forced landings, in those early days, were hazardous indeed, but more and more fields are being cleared to reduce the risk involved in "lighting in the trees."

In 1928, the forest service stopped the use of army planes and contracted with commercial companies for its aerial patrol work. These contracts were made with flying companies operating in Oregon, Washington, northern Idaho, western Montana and California. Bases were maintained at Tacoma and Spokane, Wash.; Portland, Oreg., and Oakland and Los Angeles, Calif.

Thus, today, the airplane works in co-operation with the forest ranger or "lookout." When the lookout sights smoke, he must locate the spot of conflagration on his regional map. Then, by telegraph, he communicates with the fire-suppression headquarters of the district, and men, picturesquely called "smoke chasers" are dispatched to put out the blaze. But after severe "dry" lightning storms, when as many as 300 fires are burning in one district, it is impossible for the lookout to spot them all. Here the air patrol helps out.

When C. W. Meredith, assistant fire warden of the Los Angeles county forestry department, made his first patrol flight, he was detailed to observe the Ridge Route fire of 1928, and make a survey of its extreme western boundaries.

"We climbed aboard, taxied out, headed into the wind and were off at 5:15 p. m.," relates Mr. Meredith. "While I was arranging my maps and getting ready for a hurried survey of the fire line, we were gaining altitude. We found that the ceil-

One of the Forest-Service Patrol Planes Used to Spot Fires over Klamath National Forest in California; Each Plane Carries Its Two-Man Crew of Pilot and Observer

ing was very low, and off to the west the fog was rolling in thicker than the well-known peasoup. A pall of smoke lay over the rest of the surrounding country, and my fears grew to grave concern that our mission would spell failure. It was of vital importance that the men on the ground should know the direction of the fire and at what points it was making the most headway.

"It was our duty to get the information to the fire fighters that evening, for on a going fire we have a decided advantage in our favor at night; that is, providing there is not a high wind blowing. At night the humidity rises and the temperature drops, consequently fires are reduced to a lower burning point.

"When we were over the portions of the fire that had been brought under control, I slipped out of my safety belt and grabbed my map and pencils. Being in the forward cockpit, I did not have the vision that I would have had were I in the rear. I tried standing up, but my chute inconvenienced me and the air currents over the fire made the going bumpy. My pilot took a hand, and by banking the ship to the right or left at an angle that would give better visibility, made my work much easier.

"It was close to being dark when we turned south for home, and at 6:40 p. m., we were once again at the Saugus field. I telephoned the results of the survey and reports were rushed to the camps on the fire lines. The information was obtained in one hour and fifteen minutes."

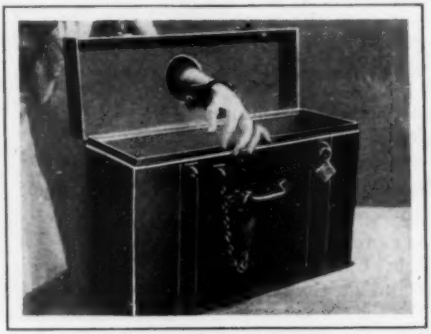
This Two-Story House Was Built Years Ago by a Prospector in the Stump of a California Redwood 3,000 Years Old

BUNGALOW ERECTED IN STUMP OF CALIFORNIA REDWOOD

In the stump of a California redwood, estimated to be 3,000 years old, a mining prospector years ago built himself a two-story dwelling which is still intact in what is now General Grant National Park. He kept his horse downstairs and lived in a room on the second floor.

BURGLAR-PROOF STRONG BOX HANDCUFFED TO CARRIER

Intended to thwart thieves when valuables are being carried through the streets, a woman detective has invented a strong box which is handcuffed to the carrier and also equipped with a burglar alarm. The wrist is thrust inside the cover and chained to a handle there. Pressure of the messenger's fingers sets the alarm sounding if an attempt is made to kidnap him.



To Thwart Thieves, the Messenger's Hand Is Chained to the Handle of This Strong Box

© P. & A.

In Circle, German Glider Which Set Record, and, Above, Transporting It by One-Horse Power

GLIDER MAKES WORLD RECORD IN GERMAN CONTEST

Robert Kronfeld, German aviator, and his glider "Vienna," established a world record for motorless planes in the tenth annual international glider contests recently held in Germany. The "Vienna" and its pilot flew 150 kilometers (about ninety-three miles) and reached a height of 2,000 meters (4,400 feet).

AUTO HIGHWAY TO ALASKA

Alaskans are planning an automobile highway connecting that country with the United States by way of Canada, with Seattle as one terminus and Fairbanks as the other. Of the 2,000 miles necessary, 1,250 miles of road already is constructed. Aside from opening up the country to tourists and sportsmen and aiding agriculture and commerce, Alaskans claim the project would also help the proposed air route to Asia by way of Alaska.

WHITE-HOUSE PHONE SYSTEM GREATLY EXPANDED

Included in President Hoover's plans for efficient administration of government business are additional telephone facilities, and a switchboard, equipped for eighty telephone lines and forty trunk and tie lines, has been ordered. Telephone service in the White House first was installed during the administration of President Hayes, but the first switchboard serving the executive offices was not in operation until 1901. The service was expanded during the war. President Hayes and President Cleveland rarely used the telephone and even President McKinley transacted little government business by phone, because the system was not extensive enough. President Roosevelt likewise did not use the telephone much, but President Taft employed it extensively and President Harding transacted daily routine business by phone. President Wilson, however, was not a telephone user, but President Coolidge found it helpful in his daily work.

EIGHTY-THREE INSTRUMENTS GUIDE AIR LINERS

Flying a big tri-motored transport plane requires watching eighty-three different controls and instruments, including the separate devices showing the functioning of each of the engines. Preparatory to landing, it is necessary that pilot and co-pilot check the position of ten controls, and, at night, this number is increased to twelve when landing lights must also be adjusted. In one of the Boeing transport planes, there are twenty-seven electric lights, eighteen of them with individual switches. In addition to the routine operations of flying, the pilots, in landing, must adjust the horizontal stabilizer, switch on the generator cut-out, put on the reserve tank, switch on both wing tanks, put altitude adjustment to "rich" on left, central and right motors, and adjust the throttle of left, center and right wing landing lights in position.

BABY HUMMING BIRD IS NURSED WITH MEDICINE DROPPER

When a California man found a baby humming bird, he took it home, but did not know what to feed it. After diligent search of bird literature, he learned that honey and sugar were humming-bird delicacies, and fashioned a nursing bottle out of a medicine dropper from which the waif learned to take its meals and soon was hopping about the house.

A Medicine Dropper Serves as Nursing Bottle for "Eleanor," a Baby Humming Bird

The Instrument on the Girl's Arm Measures the Effects of Violet Rays on the Skin

TIME NEEDED TO ACQUIRE TAN MEASURED BY MACHINE

Effects of ultraviolet rays on the skin are determined by an instrument used by the Chicago health department. In measuring the time required for tanning by sunshine, the minimum has been shown to be about thirty minutes. The test consists in making a series of exposures of the skin to sunlight through the apparatus, which is a metal plate containing a dozen holes with shutters. The appliance, with shutters open, is placed on the arm, and one shutter after another is closed at five-minute intervals for an hour.

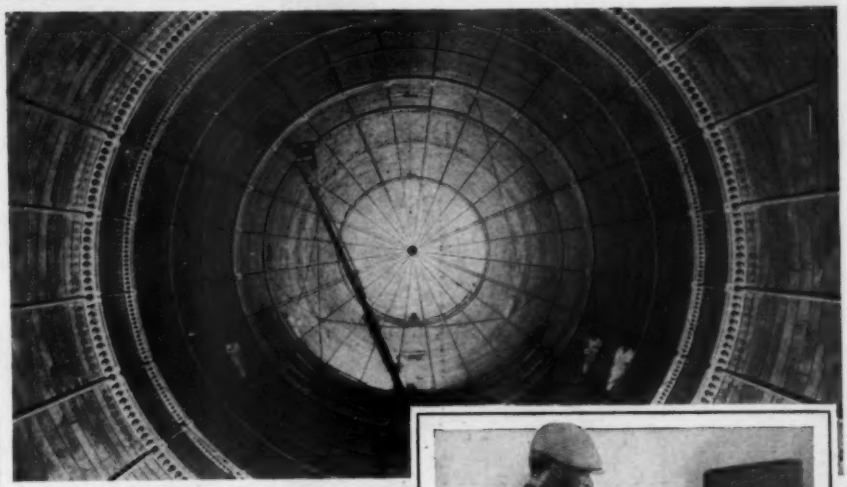
NOISES FOR DRAMA OVER RADIO RECORDED ON PHONOGRAPH

"Crowd noises" and background sound accompaniment of dramatic productions broadcast over the radio, including gunfire, train sounds, opening and closing of gates and doors, and cheering and hissing, are being recorded on phonograph records for permanent use by a British broadcasting company. As required, the company sends out its men to make records of noises of trains and elevators or of water lapping along a beach, as the play may specify. The method is costlier than the older one, but more realistic.

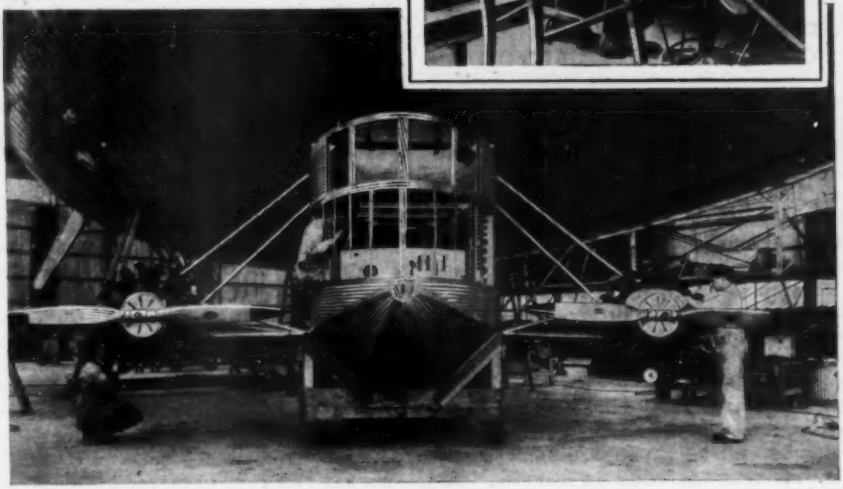
WORLD'S FIRST ALL-METAL DIRIGIBLE BUILT

Vertical Construction by Sections Was Employed, as Shown Above, in Building the "ZMC-2," First Metal-Clad Airship; It Is a 200,000-Cubic-Foot Dirigible, Built at Detroit for the U. S. Navy, for Experimental Work

FOR THE NAVY HAS A LONG FLYING RADIUS



Above, Unusual Interior View of the Metal-Covered "ZMC-2," Which, Engineers Say, Is the Forerunner of Super Metal Airships to Be Used in Transoceanic Flight; at Right, Automatic Riveting Machine Used to Build the "ZMC-2," Which "Sews" 5,000 Rivets an Hour and Does the Work of 120 Men; in the Metal Ship There Are 17,596 Feet of Riveted Seams, or About 3,000,000 Rivets; Below, Front View of the All-Metal Control Cabin and Some of the Motors, Developing 440 Horsepower



Courtesy General Electric Co.

An Electric Cableway Which in Six Minutes Transports 24,000 Pounds of Lumber a Half Mile over a 1,200-Foot Canyon

ELECTRIC TRAM HAULS LUMBER OVER HALF-MILE CANYON

Spanning a canyon a half mile wide, the largest electric cableway in the world transports lumber from a loading point on one side to the mill on the other, near Camino, Calif. The tram carrier hauls 24,000 pounds of sawed lumber between the two terminals, 2,700 feet apart, making a round trip over the 1,200-foot canyon at a maximum speed of 1,800 feet a minute. The round trip takes a little over six minutes, including loading and unloading. Four steel cables, each two inches in diameter, support the carrier, which runs on thirty-two wheels, while the one-inch traction rope is endless. The electric equipment includes two 225-horsepower hoist motors, operating in parallel. A single manually operated master controller governs both motors, geared to two large sheaves which engage the traction rope. Stopping the carrier normally is accomplished automatically, in four graded steps, and "spotting" the car at terminals for loading or unloading is accomplished by the use of a push button. Magnetic brakes will stop the carrier when descending if the power fails.

MIRRORS AND LOUD SPEAKERS DIRECT COAL-YARD GANG

Executives of a Toledo, Ohio, coal company issue their orders to yard employes through a public-address system and see that their instructions are being obeyed. The system involves the use of a reflector combining the properties of mirror and field glasses along with the voice-amplification unit. A man receiving a message through the loud speakers raises his arm to indicate that he has heard it, and this movement registers on the operator's mirror.

SUN'S ACTIVITY HELPS RADIO RECEPTION IN DAYTIME

Better daylight radio reception in 1929 has been attributed by the bureau of standards to solar activity. A study has revealed that daylight reception this year has been at a maximum and static at a minimum as compared with recent years, and solar activity also has been at or near its maximum in its eleven-year cycle. In 1923 and 1924 reception was weak, and static was high, but since 1927 has been falling off. When solar activity increases, something resembling ultraviolet radiations are given off in larger amounts, affecting the earth's electrical atmosphere.

The Facts About Hail

Courtesy Dr. Clyde Fisher

Hail Fell to a Depth of Three Feet on the Level during This Remarkable Storm in New Mexico; Note the "Natural Bridge" Formed by Stream under Hailstones

By CALVIN FRAZER

THOUGH hail is familiar to everybody, the majority of human beings go through life without witnessing a really destructive hailstorm. Many such storms occur every year, but each is limited to a relatively small portion of the earth's surface.

Although, geographically speaking, the severe hailstorm, like the tornado, is always a small affair, it represents such a concentration of nature's destructive fury that, in the aggregate, hailstorms levy a heavy toll on property. The average annual damage done by them in the United States is three or four times that done by tornadoes. According to a recent estimate, the hail losses on ten leading agricultural crops of the country amount to $47,500,000 in the average year. The losses on these crops in the year 1915 totaled $69,000,000. Last year there were two hailstorms in the state of Kansas, each of which cost the farmers $3,000,000.

The loss sustained by agriculture is only part of the annual hail bill. In the old world some of the heaviest losses occur in vineyards, and on both sides of the ocean, greenhouse glass comes in for an immense share of damage. Ordinary windows are sometimes broken on a large scale. A remarkable case of this kind occurred in Vienna, Austria, when an early-morning hailstorm smashed more than a million window panes in the course of a few minutes. Another possibility in the line of hailstorm losses was illustrated at Dallas, Tex., in 1926, when big hailstones riddled the tops of thousands of automobiles, shattered many windshields and wrought damage totaling about $100,000 to these vehicles. This hailstorm was the most destructive that has ever occurred in an American city. Tons of ice fell on streets and buildings during a period of fifteen minutes, and in the business center of the city the stones attained

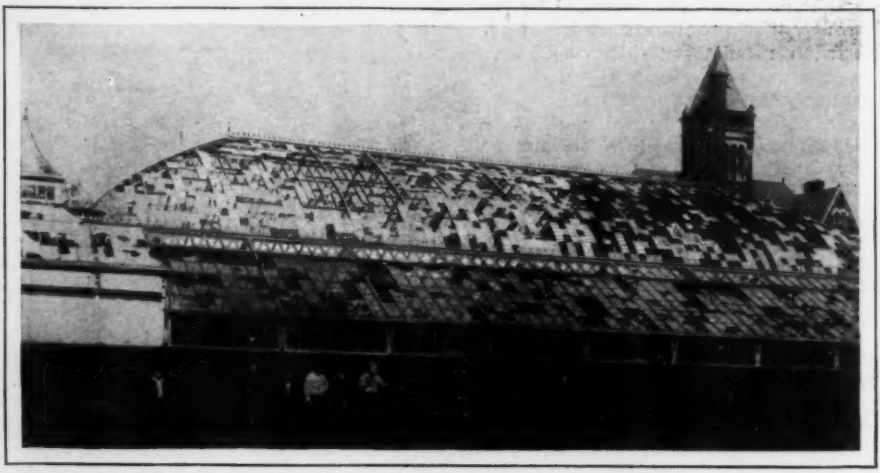
the size of baseballs. Not only were thousands of windows and skylights broken, but a great many tile, slate and shingle roofs were wrecked, street lights and electric signs were shattered, and there was the usual damage to greenhouses. The losses in the city and its vicinity were estimated at $2,000,000.

According to an official publication of the weather bureau, an unusually severe hailstorm swept a path five miles wide across the southern part of Gove county and the northern edge of Lane county, Kansas, on the night of June 4, 1927. The report says: "Fields in the path were left as bare as a highway. Trees were stripped of branches and leaves, and horses, cattle, hogs, sheep, rabbits, chickens and wild birds were killed. Hailstones piled into drifts eight to fifteen feet deep, and many of these drifts remained for three days after the storm."

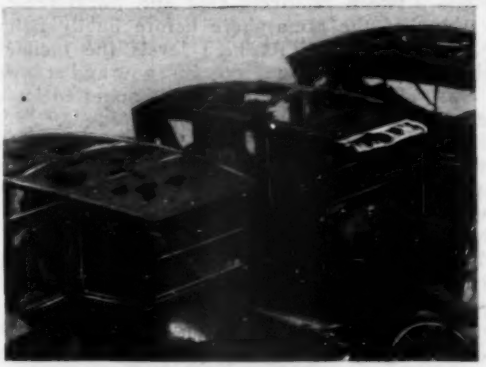
There is a proverb in eastern Europe to the effect that "hail brings not hunger"; referring to the fact that, because of its local character, a hailstorm cannot cause a general famine. There was, however, a case in which a hailstorm caused such widespread distress that it helped bring about a great social upheaval—the French revolution. Beginning in the center of France in the early morning of July 13, 1788, this storm passed northward in two parallel bands about twelve miles apart, crossed Belgium, and finally died out in Holland in the afternoon. One band was ten miles wide and 420 miles long, the other five miles wide and 500 miles long; making the total area over which hail fell vastly greater than in the average hailstorm. No less than 1,309 communes in France suffered from this visitation, and the total losses were estimated at $5,000,000—an immense sum at that period. This disaster undoubtedly hastened the coming of the revolution.

In comparison with the enormous damage done to property of various kinds by icy missiles from the sky, the number of human beings killed or seriously injured by hail is insignificant. Why this should be so is a mystery. Leaving exceptionally large hailstones out of consideration, it is not at all uncommon for hailstones weighing from one to several ounces to fall by the thousands or tens of thousands on inhabited areas. The speed with which they fall, in many cases, is indicated by the fact that they smash skylights of heavy wire glass, pierce window panes with a clean round hole, like a bullet, and bury themselves a foot deep or more in soft earth. Why do not these missiles slay scores or hundreds of people every year? No satisfactory answer to this question has yet been offered.

The most fatal hailstorm of which we have an authentic record was one that



All That Was Left of the Glass in a Pennsylvania Greenhouse after a Severe Hailstorm; This Shows Why Hail Insurance Is Popular in Many Localities

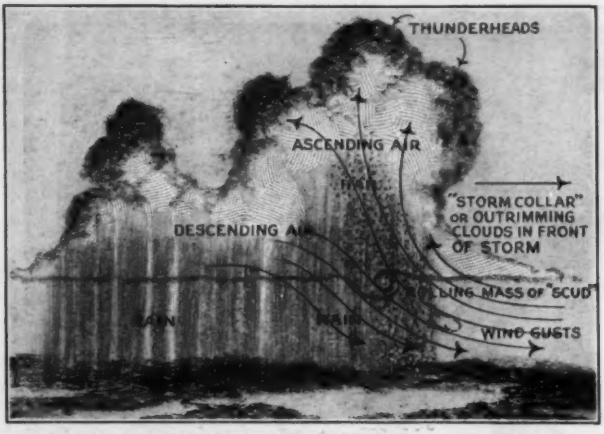


After a Hailstorm in Montpellier, France, Plaster Models of Large Stones and Auto Tops Riddled by Hail

occurred at Moradabad, India, May 1, 1888, which cost about 250 lives. According to one English writer who witnessed the effects of this storm, a majority of the victims were actually pounded to death by hailstones, but according to other reports most of them were knocked down by hail and wind, buried under the drifts, and died of cold and exposure. There have, however, been several cases reported from India in recent years in which hailstones killed from one to a dozen or more people by the direct action of the hailstones. Big hail seems to be more prevalent in India than in any other country. Writing of the furious hailstorms of eastern Bengal, Mr. W. R. Haughton says,in a recent article:

"Hailstones of over three inches in diameter are not unusual. I have seen two hundred cattle killed by hail in a single storm. These large hailstones may be sometimes seen falling few and far apart, when they look like small birds swooping down."

At the village of Klausenburg, Roumania, on May 1, 1928, six children were killed and ten



Cross Section of a Typical Thunderstorm, According to Dr. W. J. Humphreys of the Weather Bureau, Showing Ice or Hail "Factory" in Clouds

adults were badly injured by hail during the celebration of the May-day festival. On July 4 of the present year two men and one woman were killed and several persons were injured by hail in the suburbs of Nuremberg, Bavaria. These events were quite exceptional, however, for in most years there are no deaths from hail in Europe, and apparently not more than two or three have been recorded in the whole history of the United States; the only case of recent date was on May 21, 1928, when a fourteen-year-old boy was killed by hail while working in a field near Laredo, Tex.

The maximum size attained by hailstones is a matter of great uncertainty. A new record of size for the United States is said to have been established by the storm that occurred at Potter, Nebr., on July 6, 1928, when among numerous hailstones "as large as grapefruit" one was found to be seventeen inches in circumference and to weigh one and a half pounds. This huge stone, with several others, was measured, weighed and photographed. At Cazorla, Spain, on June 15, 1829, houses were crushed under blocks of ice some of which are said to have weighed four and a half pounds. In the summer of 1902, hailstones weighing ten pounds were reported by an English missionary to have fallen at Yuwu, Shansi province, China. The missionary undoubtedly found such stones, but did they fall? The fact that hailstones lying packed closely on the ground readily freeze together to form huge masses of ice is at the bottom of all the most remarkable hailstone stories not made out of "whole cloth."

Not all particles of ice that fall from the sky are hail. Little pellets like miniature snowballs, about the size of coarse shot, falling in cold weather, are known to science as "graupel," while the bits of clear ice, like frozen dewdrops, that also fall during the cold season are called "sleet." True hail occurs almost exclusively in connection with thunderstorms. It is usually of brief duration, though it has been known to fall steadily in one place for more than an hour.

A distinguishing feature of true hail is that it consists partly of ice and partly of snow. Large hailstones frequently show several alternate layers of these substances. Most hailstones are approximately spherical or somewhat conical, but other and very striking shapes are sometimes found. The peculiar structure of hailstones is explained by the fact that hail is formed in the turbulent region at the front of a thunderstorm, where it makes several journeys up and down between relatively cold and warm regions of the atmosphere before finally falling to earth. At high levels the incipient hailstone is coated with snow and at lower levels with rain, which changes to ice as the stone is again carried aloft.

Red hail is a reality, though very rare. As in the case of red rain and some red snow, the color is due to fine dust in the atmosphere.

EARTH AS GREATEST DYNAMO YIELDS MUCH ENERGY

Generating enough current to supply light, heat and other electrical needs for the ten largest cities in the United States for 1,000,000 years, the earth is a huge dynamo and one of the greatest electrical

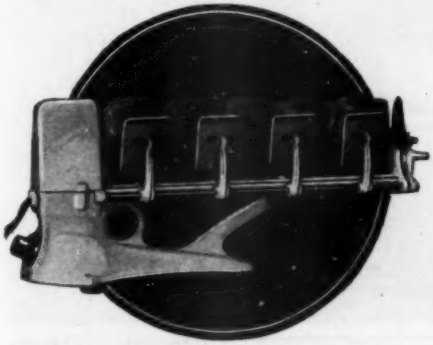
wonders of the universe. Dr. Ross Gunn, of the naval research laboratories, estimates currents generated inside the earth at more than 200,000,000 amperes, although this energy, like atomic energy, is unavailable for use by man, being kept in nature's storehouse for the benefit of generations perhaps a million years hence. He attributes the electrical currents inside the earth to the motions of tiny electrical charges known as electrons, the motions being caused by the high temperatures existing inside the earth.

REMOVES POISON FROM DRUGS

Drugs such as those contained in morphine, coffee or tobacco may be made innocuous while preserving full medicinal qualities, a German scientist declares, by adding small quantities of lipoid, a neutralizing wax or fat-containing matter which is present in many animal and vegetable bodies. With coffee, for instance, the scientist says, the addition of a few drops of lipoid entirely obliterates the noxious effects, while preserving the nutritive and momentarily sustaining effects.

ELECTRIC TOASTER FOR BUNS MAKES HOT SANDWICHES

Bun sandwiches may be served hot and toasted by using an electric oven intended primarily for buns, but which may be used for bread also. It takes from five to ten buns, or eight slices of bread, at a time and requires less than a minute for toasting. The device adjusts itself automatically to various sizes of buns.



An Electric Toaster for the Quick-Lunch Counter Provides Customers with Hot Bun Sandwiches

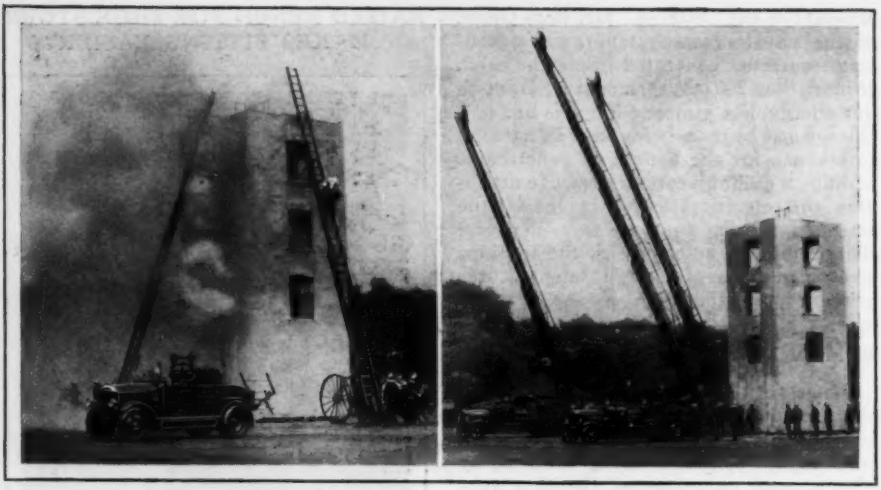
RAISED BENCH FOR SHOE STORE MAKES FITTING EASIER

Fitting Shoes Is Made Easier for Salesman and Customer by Using This Raised Bench

Greater comfort for customer and salesman alike is provided by a raised bench for the purchaser of shoes which brings him up to a height where the clerk may fit shoes without stooping. Wide steps are provided for the bench, and to the salesman's right is a cabinet where shoe accessories may be kept.

TALKIES FOR THE DEAF

Talking pictures are proving a source of amusement for the hard of hearing in Brooklyn, where a section of a theater has been fitted with acoustic equipment for the use of persons whose hearing is impaired. Each seat of the section has a receiver and headpiece and a potentiometer, shaped like a fountain pen. A control button on this instrument regulates the volume of sound to the hearers' needs. According to government statistics, there are 15,000,000 deaf persons in the United States, and many of them viewed the talkies with alarm because they feared they would be unable to follow the picture without the usual titles.



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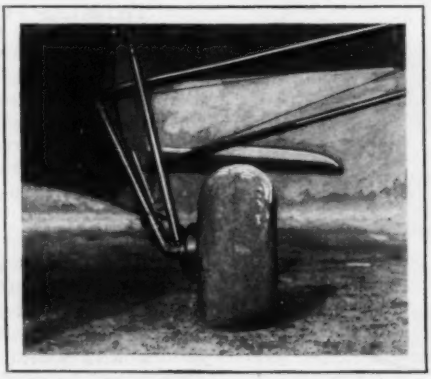
The Prince of Wales Witnessed a Display by the London Fire Brigade, Including Thrilling Rescues from a Burning Building and Daring Feats on Extension Ladders, Such as Pictured Above

LONDON'S FIREMEN DO STUNTS FOR PRINCE OF WALES

London fire fighters performed stunts for the Prince of Wales at the annual display of the fire brigade recently. Among the feats witnessed by royalty was a rescue from a burning building and daring tricks executed from the top of lofty extension ladders.

AIRPLANE TIRE ACTS AS WHEEL AND SHOCK ABSORBER

Requiring no wheel, but fitting directly onto the hub, an airplane tire of great thickness has been successfully tested as landing gear. The cushioning effect of the tire under low air pressure causes it to act as a shock absorber as well. Brakes can be fitted to the hub, if desired, and experiments have shown that the tire reduces take-off time on all surfaces except concrete. The tire resembles a huge doughnut and is streamlined so its wide cross section offers minimum wind resistance.



This Airplane Tire Fits Directly onto the Hub, Acting as Wheel and Shock Absorber

PARACHUTE OPENED BY WATCH LOWERS MAIL FROM PLANE

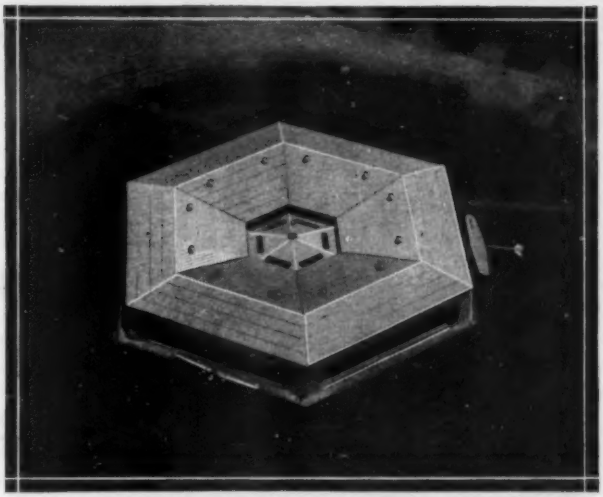
Delivery of small packages of mail from an airplane while it is in flight is accomplished by an apparatus attached to the mail bag which opens a parachute after the pouch is dropped. An aluminum shell is equipped with a precision watch and is attached to the top of the sack while above the shell is a small parachute folded in a frame. The pilot adjusts the watch according to his altimeter reading and throws the mail overboard. The watch releases the parachute at a designated height, and the mail floats to earth. A large model is capable of lowering sixty-six pounds and, in an-

other form, a parachute is attached to a skyrocket which lights at the moment contact with the earth is made.

TALKING PICTURES SHOWN IN SLOT MACHINE

Slot machines now dispense talking motion pictures. A Massachusetts man has invented an apparatus designed to project talking and singing films when a dime is dropped in a slot. The films may be shown in daylight in a boxlike structure, five minutes being required for one picture. The coin is dispensed with in machines intended for the home, the apparatus then being controlled by a switch. When a coin is inserted, red and blue "footlights" flash on, a curtain rises displaying a screen twenty-four inches wide and twenty inches high, after which the lights are dimmed and the picture begins. The inventor calls his appliance an "acrophone."

Talking Moving Pictures Are Shown by This Machine When a Dime Is Dropped in a Slot



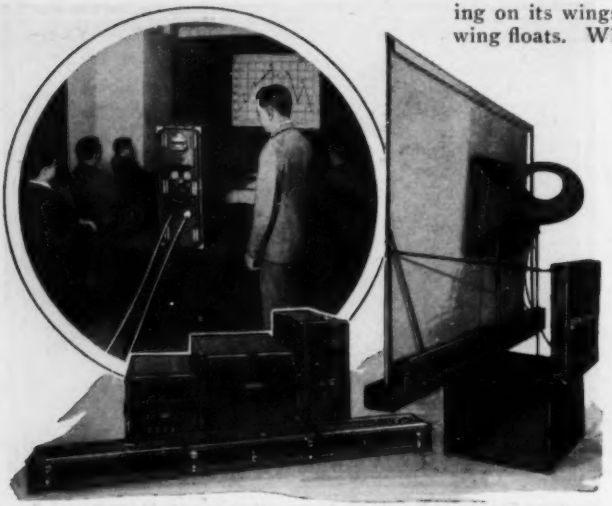
Emptying This Huge Hexagonal Airplane Hangar, with 54,000 Square Feet of Floor Space, Requires Only Thirty Seconds

HEXAGONAL AIRPLANE HANGAR MAY BE EMPTIED QUICKLY

Requiring but one minute to remove all the airplanes from its 54,000 square feet of floor space, a hexagonal hangar, believed to be the largest in the world, has been constructed at Los Angeles for the Western Air Express. Each of the six sides has a self-opening steel door 126 feet wide, and all the doors may be opened in thirty seconds. Emptying the hangar is simplified by sloping floors, enabling one man to handle a big tri-motor plane with ease.

OIL-WELL VALVE CUPS CHANGED HALF MILE UNDER GROUND

Removing the valve from a deep oil well to change cups and leathers, heretofore a tedious and expensive process, is unnecessary with a valve which allows cups and leathers to be changed automatically 3,000 feet under ground. The first operation is to drop a cartridge down the rods, which releases the valve case and brings it to the surface. Then, another case, equipped with fresh leathers, is lowered and the cartridge fastens it to the core. The whole takes about half an hour, while previously several men and a tractor were required for a day or more.



Four Trunks, Such as Shown Above, Contain an Entire Portable Talking-Picture Apparatus for Use in Schools and Salesrooms

PORTABLE TALKIES FOR SALES AND SCHOOL WORK

For use in education and industry, a portable talking-picture machine has been designed, employing the sound-on-film method of reproduction and operating from the ordinary alternating-current electric-light supply. The entire equipment is contained in four trunks and can be set up in a few hours. The apparatus weighs 800 pounds and the amplifier is of sufficient power to supply sound volume for an audience of 800 persons. Screen and horn are supported on the two trunks in which they are placed for shipment, supports to wall or ceiling being unnecessary, the screen rolling on a curtain roller which fits in the screen trunk. The machine has been used successfully in churches, classrooms, salesrooms, auditoriums and offices.

A SINGLE-WHEELED SEAPLANE

Performing perfectly in its first trials on land, a single-wheeled seaplane was demonstrated recently in New York. The wheel is fitted in the middle of the center pontoon with the hole covered by a trapdoor, so that a landing may be made in water. The ship is prevented from bumping on its wings by skids fastened to the wing floats. When alighting on or taking off from land, the weight is borne by the single wheel, with the skids supporting the wings if the amphibian tips to either side. The device, it is hoped, will solve the problem of landing gear for light seaplanes.

AIRPLANE STARTED BY SHOTGUN SHELLS

Half-length twelve-gauge shotgun shells supply the initial force for a self-starter for airplanes sponsored by Charles A. Levine, transatlantic flyer. The starter, weighing four pounds, is screwed into the aperture of a cylinder from which the spark plug has been removed. The plug then is placed in the starter in such a manner that it continues to operate after the motor has started. A shell inserted in the starter is held in place by a military-type gunlock equipped with a safety device to prevent premature firing. There is no noise, and smokeless powder is used.

Here Is a Self-Starter for an Airplane, Using a Shotgun Shell to Supply the Force

ALUMINUM COVERS FOR BOOKS RESIST TROPICAL HEAT

Because in some parts of Africa the air is so dry that the covers of books are turned back by the heat and lack of moisture, an aluminum binding has been made for volumes subject to such conditions. The aluminum cover is of about the thickness of an ordinary tin can, is light in weight, insect-proof, and washable. The metal is chemically treated to take ordinary printing ink as well as enamel or paint. The paper as well as the cover is made insect-proof, the paper being treated with a carbonate-of-soda solution.

IMPORTED PEAS IMPROVE SOIL

Three peas, imported accidentally when a veterinarian ordered two quarts of Swedish vetch for his farm, may contribute much to the wealth of American farmers. The three peas, now increased to nine bushels, have a vigorous root system, knotted with nitrogen-bearing nodules, and the vines are prolific, often extending from six to twelve feet in length. Indications are that the peas will yield about thirty bushels of seed to the acre, and a marked improvement in productivity of the soil has been noted wherever they have been planted.

TAR SHAVED FROM PAVEMENT BY TRACTOR RAKE

Confronted with the problem of removing the slippery and dangerous tar which oozed out of the cracks in the pavement during hot weather, the employes of the Delaware River bridge made a steel-claw rake and attached it to the rear of a tractor used to push a sweeper. The weight of a man on a seat over the rake forces it down into the tar, the apparatus dislodging lumps of tar, which are then gathered with the sweeper.

Scraping Excess Tar from Pavements Is Accomplished with This Tractor and Steel-Claw Rake

This 7,000-Pound Sea Elephant, a Circus Attraction, Eats 450 Pounds of Fish Daily

FOUR HUNDRED POUNDS OF FISH IS DAILY MEAL

Weighing 7,000 pounds and making a daily meal of 450 pounds of fish, "Goliath," a sea elephant owned by a circus, attracts crowds wherever the show goes. He was captured in the Lost Sea near the south pole, and weighed one ton then, but has gained 1,000 pounds a year ever since and is not yet fully grown. He is known as a sea elephant for want of a better name and is said to be the only specimen of his kind to survive captivity for any time. On the circus lot "Goliath" has a special tank holding 6,500 gallons of water and when he travels he goes on a 100-foot flat car equipped with a 10,000 gallon tank and a sand beach. He eats only fish which he swallows whole and has learned to answer his trainer's call.

Seventy years ago it took mail twenty-four days to go from coast to coast.

Gliding

"READY! Walk!" shouts the pilot, seated on a little board, with his back against an upright post, which forms one member of a rather sketchy airplane fuselage.

At his signal a half dozen men, three to the left and three to the right, walk away with the ends of a rubberized cable that leads back, in a "V," to a hook in the nose of the ship. At the tip of one wing another man trots along to hold the wings level, and behind the craft another pair pull back slightly on a tail rope.

Ten steps and the pilot shouts, "Run!"

The glider, which has been skidding along the ground on a keel skid, rises a few feet as they pick up speed. A dozen paces, and the pilot calls, "Turn loose!"

The man at the wing tip has already lost contact, and the pair in the rear, at the word "loose" drop their rope, which falls free from the ship. As the back pressure relaxes, the glider catapults upward and forward like a stone fired from a sling shot. The pulling rope, caught in its middle in an open hook, point downward, drops free, and the pilot and glider are off to soar among the birds.

That's motorless flight, as it has been introduced into America from Germany.

The ship described, with its sketchy form of fuselage and the pilot sitting out in the open in front of the wing, is a primary-training glider. For more advanced work, and particularly

Miss Maxine Dunlap, Successful Glider Pilot, and, Below, Launching a Popular Type of Glider

on the Wings of the Wind

Miss Dunlap in the Air during Her First Successful Glider Flight; in This Type of Machine, the Pilot Sits Out in Front of the Landing Skid

for real soaring flights, gliders are built with comfortably inclosed cockpits, a windshield to protect the pilot, and many even have an instrument board, featuring an altimeter and a clock, to tell both height and duration of the flight.

Since gliding grew up and came of age in Germany—one of the unforeseen results of the peace treaty of Versailles, which put obstacles in the way of motorized flying beyond the Rhine—the sport has been classified into two distinct types: First there is gliding, a term which the initiate use only to describe short flights down a wind hill, sliding down an air current just as a sled slides down a snow-hill. And then there is soaring, which is something for the adept to do, and covers any flight in which the glider pilot takes advantage of rising currents of air to ascend to a greater height than that from which he started.

Given the proper sort of terrain below, which means the right kind of air currents above, and there is almost no limit to what a good soaring pilot can do. German glider experts have stayed in the air more than fifteen hours, climbed to heights of more than 2,000 feet above the point from which they started, flown as far as 200 miles, and more than forty miles in a point-to-point race. An expert in soaring can take off, climb hundreds of feet in the air, circle, cut figure eights, and eventually come back to the starting point as easily as though he had a motor to pull him wherever he wanted to go.

The pilots who have done that, describe soaring flight as life's greatest thrill. They go up and play among the birds as equals; in fact, last summer when Peter Hesselbach, the German pilot, visited this country and made a ten-hour flight at Cape Cod, a flock of seagulls came in from the ocean, fell into line and flew alongside in formation while they studied this strange, new, noiseless bird plane.

It takes from thirty to sixty days in a glider school for a graduate of primary-training gliders to master the secrets of the more responsive soaring ship. It not only is necessary to know how to fly it, but the flyer who hopes to go after duration records in the motorless-flight field must be an accomplished student of meteorology, for his success depends largely

Dale L. Drake in Glider and Lloyd O'Donnell, Pilot of Plane That Towed Glider in Long Demonstration Flight

on his ability to guess, from the terrain below, the kind of air currents that are flowing about him, and so twist and turn as to take advantage of every upward thrust.

It is because of his dependence on air currents that hilly country or duneland near a large body of water make the best gliding land, for there are always upward air currents among hills, when the breezes rise from the valleys, and there is usually a rising current at the edge of any large body of water.

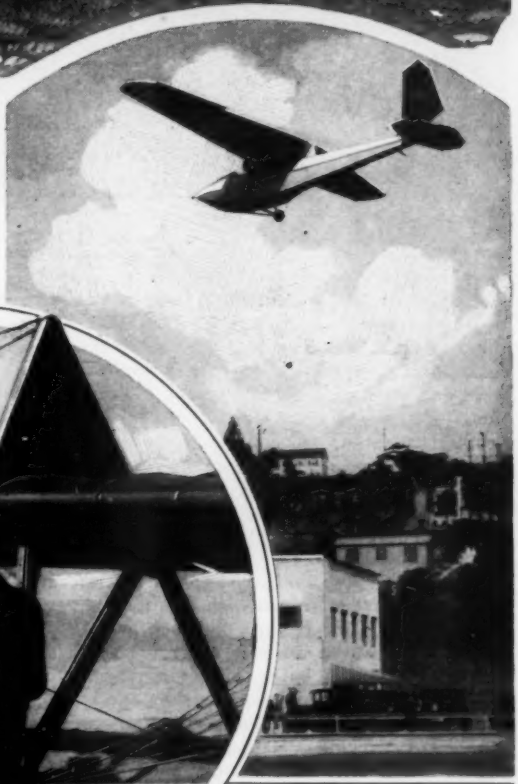
The National Glider association, which has been organized to popularize the sport in America and attempt to capture the duration and distance records from Germany, already has established glider clubs in many cities. The gliding enthusiasts are organized in San Francisco, San Diego, Portland and Seattle, on the west coast; in Denver, Kansas City, Cleveland, Akron, Cincinnati, Indianapolis and Detroit, in the central section, and at New York, on the Atlantic, as well as in many smaller towns and cities. All of the clubs, and many individual members, are building ships, either primary or soaring types, and one or two factories are turning out the former at prices as low as $500 to $600.

The glider association has issued a very explicit warning about the type of gliders that are safe to fly. They turn thumbs down on the light and cheaply constructed outfits in which the pilot's body is suspended from the framework, while he tries to get control by swaying his weight from side to side. It was a machine of this type that killed Lilienthal, the great German experimenter, whose work, with that of Chanute, contributed to the Wright brothers' success.

Instead of this type of craft, the association recommends that both primary and advanced training ships should be operated from the pilot's seat with controls exactly similar to those used in a motorized airplane. In other words, a pair of pedals work the rudder and a control stick manipulates the ailerons at the wing tips and the elevators at the tail. Experience has shown that the movements required to operate either a motorized airplane or a glider with these controls are the most natural and therefore reduce danger to the minimum.

To build a glider of the type recommended requires a rather thorough knowledge of aerodynamics and aircraft construction. In fact it may take more skill to build a good glider than it does to build a good airplane.

Why this is so can be easily understood by examining the construction details of the soaring glider being flown at San Diego by William H. Bowlus, who has been building gliders of various types since 1912. His craft is a high-wing full-cantilever monoplane, with tapered wing. In other words, the wing is above the pilot's head and has no external bracing, while it is narrower at the tips than in the center. The fuselage is built up with four square longerons, running the full length of the plane. They are only three-quarters of an inch square at their thick-



Drake in Glider Which Was Towed by Plane 200 Miles during Recent Exhibition by the Long Beach Glider Club; at Right, Glider, Designed by Hawley Bowlus of San Diego, in the Air; It Has a Wing Spread of Forty-Six Feet and Has Been Built to Enable the Pilot to Take Quick Advantage of Favorable Currents, Which Often Rise Several Times Higher than the Take-Off Hill

Charles Ferguson, President of the California Glider Club, Testing Out Controls of Glider before Making a Flight; Prize Offers for Long Hops Are Stimulating Interest in Gliding

Vance Breese, San Francisco Aviator, at the Controls of a Ferguson Glider Which Is Being Launched by Men with Aid of Tow Rope, Dropped Free as Glider Rises

est point, beside the pilot's seat, and taper to one-quarter inch square in front and three-eighths inch square at the tail. The four form a rectangle, nineteen inches wide and twenty-four inches deep, where the pilot sits. In front, the thin ends are brought together to form a horizontal wedge, like a chisel point, and at the tail they form a rectangle, ten inches high and six inches wide. The struts that brace them also are of spruce, with a square area equal to that of the longerons at the point where they are applied. The whole structure is braced with thin diagonal strips of spruce, only an inch wide and a sixteenth of an inch thick. They are wetted before being glued in place, and when they dry and shrink, they exert sufficient tension to make a rigid body, capable of carrying a 500-pound load.

Two bulkheads of plywood in front and behind the pilot's seat afford him some protection and likewise transmit his weight to the wing when in flight, and onto the skid when the craft is on the ground.

The wing itself is built in three parts, so it can be taken apart when the glider is towed to or from the field. The center section, measuring six feet, is built in as a part of the fuselage structure, and two tips, each nineteen feet long, are bolted to it to prepare the ship for flight. The ribs of the wing, and the ribs in the tail surfaces are made of "kraft" paper, with spruce strips, only an eighth by a sixteenth of an inch, glued to either side. It is almost unbelievable that such a paper web would have sufficient strength for the purpose, but tests in many flights have shown that it is actually stronger than necessary for the load it carries.

The whole craft weighs but 160 pounds, and two men can hold it up by the wing tips without any appreciable bending of the structure. The weight includes the landing skid normally used for soaring flights. In addition, Bowlus has built a light-wheeled landing gear which is used both for towing on the highway and in experimental flights, and adds but twenty pounds to the weight of the craft.

Such a machine is only for the adept to fly, but anyone with normal faculties can, under a competent instructor, make safe flights of a few hundred feet in one

Climbing: Skilled Glider Pilots Learn to Take Advantage of Favorable Air Currents and Have Reached Altitudes of 2,000 Feet; Below, William H. Bowlus in Cockpit of His Glider

of the primary training planes. For instruction purposes, the clubs seek a hillside of fairly gentle slope, clear of obstructions for at least 200 yards, and place the plane not too far up from the bottom.

The student is strapped in with a safety belt, the ground crew take positions, and the instructor calls the signals. As the ship leaves the ground, it rises a few feet and glides down the wind until it comes to rest, the length of the glide depending not only on the speed of the upward current, but the skill of the student at the controls.

At most, he cannot fall more than a few feet, and the worst damage that can be done to the ship, as a rule, is to break a few wing ribs; in fact, a certain amount of rib breakage is counted on as the ship settles down and topples over on a wing tip, since its single central skid affords no lateral stability.

A well-built glider of this type is so fool-proof that, if in doubt what to do, the student has only to return his control stick to neutral, in other words hold it vertically between his knees, and the glider will settle gently to earth of its own accord.

¶The Popular Mechanics' Bureau of Information offers its free service to all readers of this magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished.

Courtesy Holmberg Air Mapping Co.

An Aerial View of an Automobile Roller Coaster Where Motorists May Speed Up and Down over the Half-Mile Track and Enjoy All the Thrills of the Old-Time Amusement

AUTOMOBILE ROLLER COASTER GIVES MOTORISTS THRILL

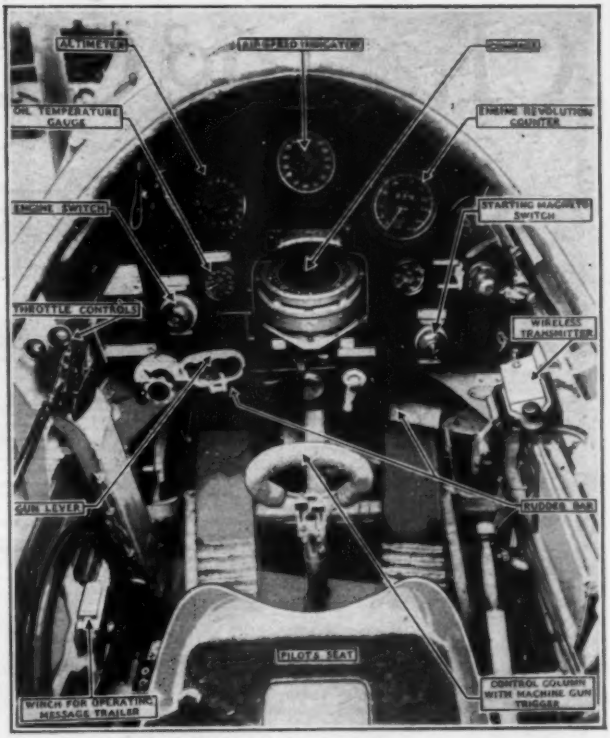
Thrills for the motorist are provided by automobile roller coasters along some of the widely traveled highways. Near Chicago a farmer has set aside a field beside an arterial road for construction of a U-shaped track where, for a dime a passenger, an automobile party may shoot the chutes and enjoy all the ups and downs of the old-time roller coaster without leaving their car. After reaching the top of the first incline, the car is virtually carried over the track by the momentum gained on the declines, and at times travels at high speed. Cars are dispatched one at a time by a starter, and motorists often wait in line for an opportunity to experience the novel trip.

VAST GLACIAL TRACT IN ALASKA REMAINS UNEXPLORED

Areas of many thousands of square miles of unexplored territory still remain under the American flag. In Alaska is a great tract of land that has never been visited by white men, and even the natives have not penetrated some of it. One of the largest of the unexplored regions lies between the Skwentna river on the north and Lake Clark on the south, and between the west front of the Alaska range and Cook inlet. This area, in the south central portion of the territory above the Alaska Peninsula, is entirely occupied by rugged glacial mountains except for a narrow strip of low marshy land between Cook inlet and the mountains. A portion of this territory was invaded by geologists and topographic engineers of the geological survey under considerable difficulties, and an area of about 1,200 miles was mapped. In this new unknown country, where streams are too swift for ordinary boating and the only trails are those made by the native animals, the map makers used the primitive methods of transportation, including the pack horse and the boat dragged by hand through swift currents. In one locality, no human being was seen for more than two months, and even signs of native camps indicated that they were from twenty to thirty years old. The animal life remains virtually undisturbed, black and grizzly bears, caribou, moose and mountain sheep being found in abundance. Fish, however, are scarce in most of the streams because of the large amount of glacial silt in the waters.

PULSATING EARTH MAY CHANGE QUAKES

Pulsation of the earth, causing it to expand a little, then to contract slightly, may be responsible for the shift of the centers of earthquakes away from the equator during the twentieth century in the opinion of Prof. T. Terada and Dr. S. Miyabe, of Tokio Imperial University. Successive earthquakes in Japan recently have shown a tendency to appear farther and farther north, and the investigators, in trying to find the cause for the slow change in the latitude of the quakes, searched records to find if there had been similar occurrences. They learned that during the sixteenth century earthquakes in Japan and Eurasia moved south while those in South America moved northward, all approaching the equator. About 1600, however, the tendency was reversed and they moved away from the equator, only to move toward it again about 1700 with a reverse tendency noted about 1800. Approaching 1900, the Eurasian quakes again moved south and the South American ones north, but as the century opened, they went in the opposite direction. Earthquakes in North America also moved approximately in the same way as others of the northern hemisphere. Two Dutch astronomers have studied the unexpected shifts of the moon from predicted positions on a theory that this might affect the locality of earthquakes, and the Japanese scientists compared these findings with the curves representing the quakes' movements. Although there is a rough agreement, they think it more likely that the earth itself pulsates over a long period and that these pulsations govern the quakes.



Pilots of the Australian Air Force Face This Maze of Controls When They Fly One of the Combat Planes Recently Purchased

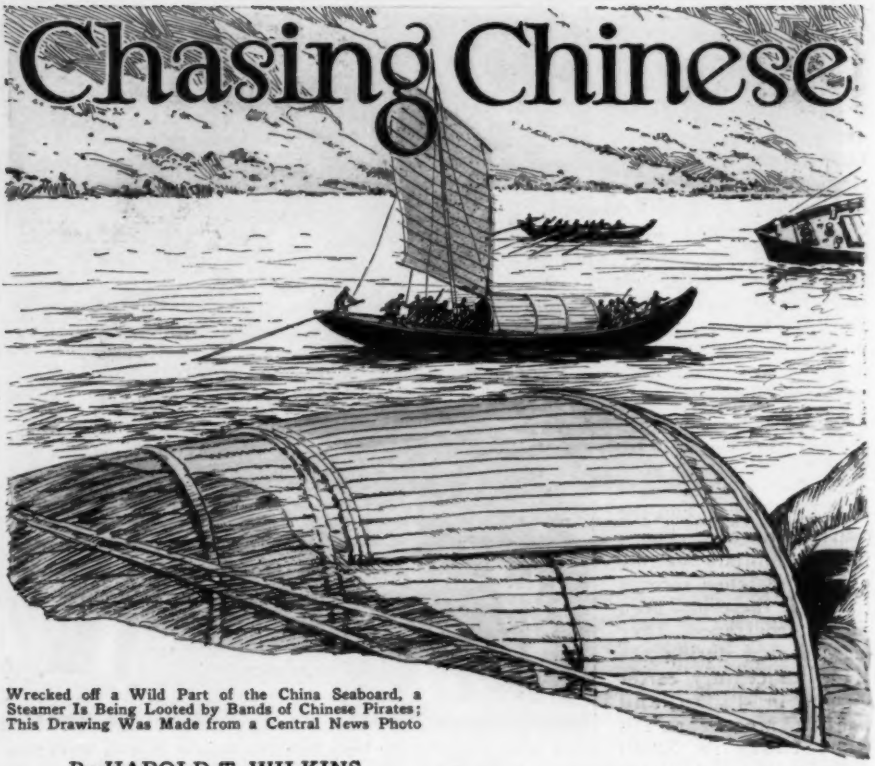
MAZE OF CONTROLS IN COCKPIT OF AUSTRALIAN PLANE

Pilots of the royal Australian air force face a maze of controls when they enter the cockpits of the planes recently constructed for use there. Besides all the instruments necessary to operate the ship, there are many others, including a device for operating a message trailer and a machine gun. Had such machines been available earlier, pilots say, they might have been able to save the two flyers who perished in central Australia while seeking the airplane "Southern Cross."

WORLD'S FASTEST WAR SHIP

Remarkable achievements in French naval construction were demonstrated recently when the "Valmy," latest war ship constructed under the post-war plans, attained an average speed of 39.85 knots.

Chasing Chinese



Wrecked off a Wild Part of the China Seaboard, a Steamer Is Being Looted by Bands of Chinese Pirates; This Drawing Was Made from a Central News Photo

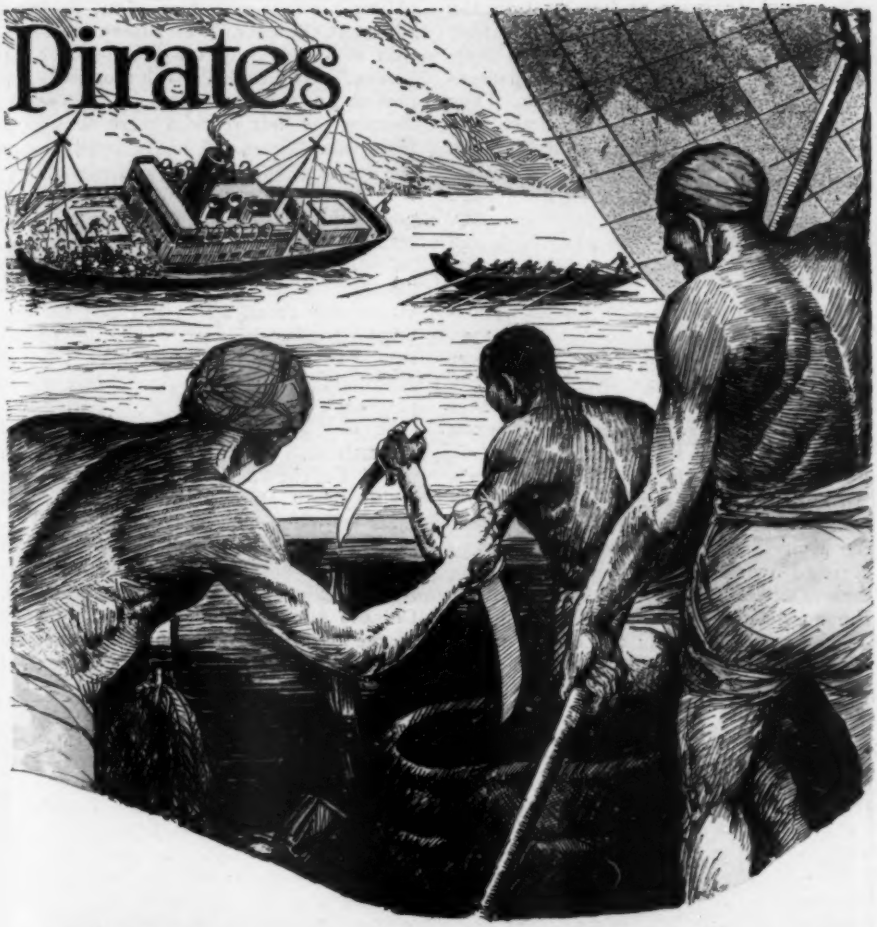
By HAROLD T. WILKINS

THE old-time pirate, with a slash across his face, picturesque gold earrings, and a brace of Spanish pistols, could be recognized easily even without the "Jolly Roger" flying at the masthead. But the modern pirate of the China seas—his equal in ferocity and daring—depends for his success on the fact that his blue dungaree trousers and coat are exactly the same in appearance as those worn by millions of honest Chinese workers.

He comes as an ordinary coolie aboard a steamer plying between the ports on the China seaboard. To the eye of the officer who scans him shuffling up the gangplank, carrying his food and pots and pans, he seems what he says he is—a poor coolie on the way to seek work in another port. He joins the hundreds of other coolies on the open deck and makes himself as comfortable as the hard planks allow. To the shipowner he is a profitable item of cargo and it is not until some months later, when the relative of a wealthy Chinese passenger, captured on that steamer, receives a severed ear or thumb—a hint to forward a remittance promptly or something worse may happen—that it becomes evident the innocent coolie and his equally innocent-appearing brothers were neither profitable nor harmless.

The British government recently has become seriously alarmed at the growing frequency and daring of the buccaneers of the north and south Chinese seas and rivers. A few months ago, a member of parliament proposed that seaplanes should be used to chase pirates in the Chinese waters and deltas, just as the British admiralty's anti-slavery patrol in the Persian gulf, today carries a flying boat armed with bow chaser guns to war on the Arab slave dhows which at night frequently run cargoes of slaves from the Abyssinian

Pirates



coast of the Red Sea across to the "bad spots" of Arabia. The Chinese government of Canton has now joined Uncle Sam and John Bull in the war against river and sea pirates in the notorious Canton delta.

Recently, an adventure recalling the Middle Ages at their worst, happened in one of these pirate campaigns. After a fierce night attack on a pirate castle in Fu-kien, south of Shanghai, in which the pirates put up a desperate resistance, Chinese marines and a brigade of mixed troops stormed a high wall and entered the castle, which has 130 rooms. They found a ghastly torture chamber of huge dimensions, in which forty captives were hanging in chains or bound on tables. The stone pillars and walls were stained with blood. A terrifying assortment of medieval instruments of torture were found. Many hundreds of victims, captured from looted steamers, had been held for ransom in this den, and been killed or maimed. The stronghold was in the middle of a dense forest on an island in Hinghwa bay, and the pirates had carried on their operations for years past.

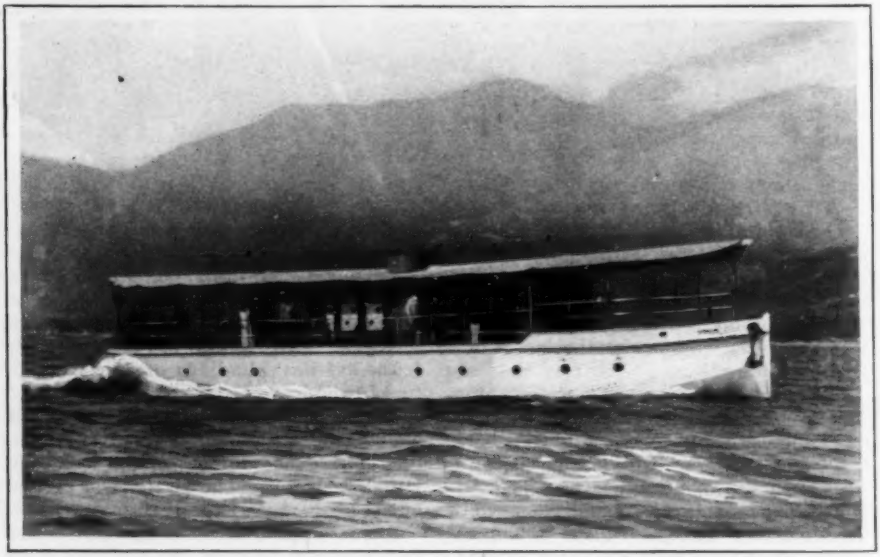
The steamer "Irene," flying the Chinese flag, was steaming off the Chinese coast recently, bound for Amoy, her captain, J. H. Jansen, a Norwegian, and his second

officer and engineer at breakfast in the cabin, when a pirate appeared and shot the Chinese steward. Other pirates overpowered the officers, robbed the passengers, and made for the bullion room. They collected their loot, and ordered the ship to steam slowly so as to reach Bias bay about dark. A few pirates kept guard, while the rest gambled and gorged below. The "Irene" was creeping into Bias bay, when the pirates got a shock. Anchored under the lee of the land for the night was the British submarine "L-4," and her captain, seeing a steamer with no lights, suspected something was wrong. He flashed out the signal, "Stop at once!" No answer came. The submarine switched on her searchlight, and fired a blank shot. Still no answer. Then the pirates fired on the submarine, which retaliated by firing two live shells across the bow of the steamer. All this time, the "Irene's" captain was on the bridge, under the guns of the watching pirates, but he rang for the engines to stop. Down below in the engine room, pirates, at the muzzle of the pistol, forced the engineer to keep the engines running.

Then a shell burst in the engine room, putting the engines out of action, and disabling a pirate who was about to shoot the chief engineer. The submarine's captain saw men leap off the deck of the "Irene," so he took the sub alongside and picked up the strugglers in the water. Among the first rescued were six of the European officers. A heavy swell was on the sea, and the "Irene" was now ablaze from stem to stern. The submarine rescued all the passengers, many of them leaping into the water wearing lifebelts. A radio message brought up the warship "Delhi," which picked up twelve survivors and stood by to put out the fire on the blazing steamer, while the submarine, packed with 222 survivors, left for Hongkong. Twelve pirates were made prisoners.

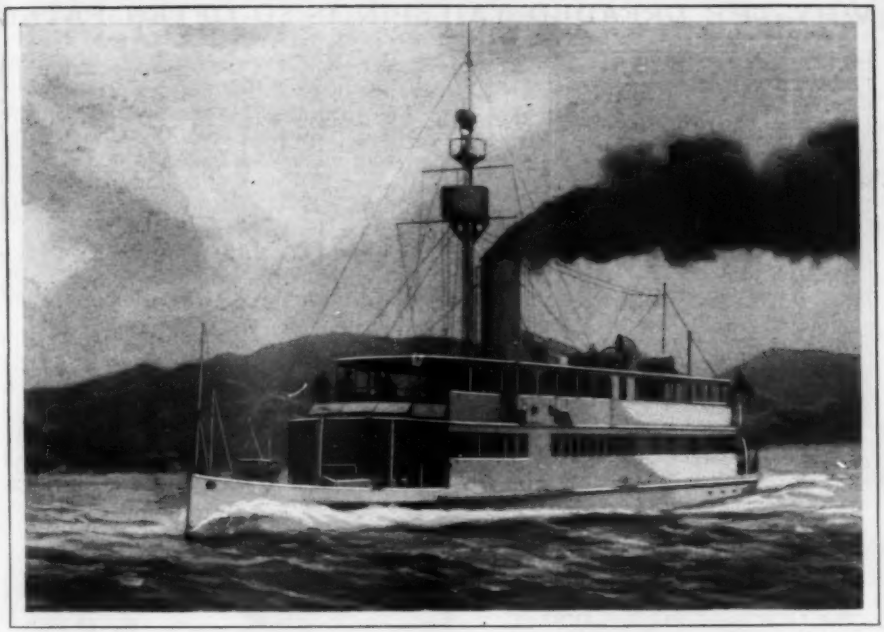
"SOS. This is the steamer 'Hsin Chi' in distress. We are beached on Tae island, Foochow. Hundreds pirates round waiting loot ship. Hurry. Can't hold them off much longer!"

The wireless operator on the British destroyer "Serapis" read off this message recently, and rushed it to the captain. A Chinese gunboat, which had also picked up the message, was first on the scene, but stood helplessly by while a hurricane raged



Courtesy C. B. D. Lauchan

Cruising South China Waters Where Piracy Is Rife Today, an Armed Motor Launch Keeps Vigil over Vessels That Might Fall Prey to Bands of Marauders



Courtesy C. B. D. Lauchan

Special Gunboat Built for Rapid Travel in Shallow Waters, Where Pirates Frequently Are Found; the Vessel Is Equipped with Radio and Powerful Searchlights

and the pirates looted the helpless steamer. Finally, they set fire to her and fled.

Another radio to Hongkong naval depot told of the capture of the British 2,200-ton steamer "Tean," on the way to that port and boarded off the island of Hainan, in south China waters. She had been taken to the notorious Bias bay, where the disguised pirates landed with seven passengers. The British destroyer "Somme" gave chase, causing the pirates to abandon their loot and prisoners, one pirate being killed.

The next and latest affair happened in north China waters where the steamer "Shasi" was bound for Shanghai from Hankow. She had left the latter port when thirty-two young Chinese refused to pay the fares which the ship's compradores were collecting. Some of these Chinese rushed the wheelhouse, overpowered the captain—an Englishman—the chief officer, the Chinese pilot, and the Chinese quartermaster. The pirates locked the captain in the cabin with his wife and two children, while the ship was left to drift helplessly. Later, the pirates unlocked the captain's prison and ordered him to let go his anchor. They then rushed the cabins of four first-class passengers.

Off Seven Miles creek, a launch came alongside, and the pirates, loaded with loot, consisting of the plundered cargo, the passengers' money and jewelry, went on board, complaining bitterly that their booty was worth only $10,000 or so. No sooner had the pirates left, than the captain of the plundered steamer returned to Hankow. A fortnight later, the Chinese authorities executed sixteen of the pirates who took part in the looting of the "Shasi."

DEEPEST FRESH-WATER LAKE

Lake Tanganyika in central Africa, believed formed in the craters of an extinct volcanic range, claims the distinction of being the deepest fresh-water lake. Depths of 4,190 feet have been located in various parts of the lake, which is 200 miles long and forty miles broad.

WHY THE DREADED TAILSPIN IS SO OFTEN FATAL

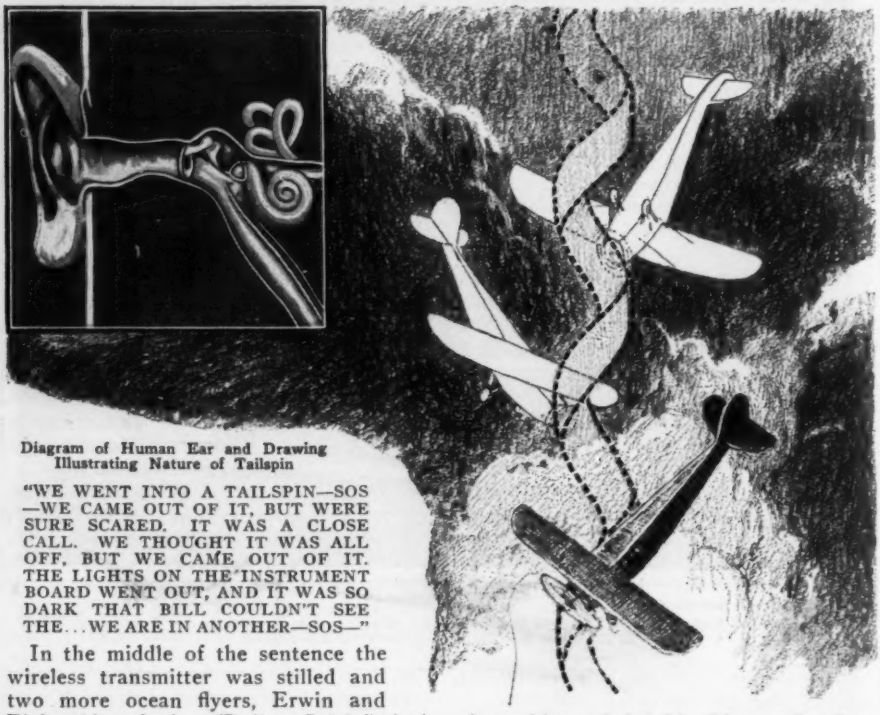


Diagram of Human Ear and Drawing Illustrating Nature of Tailspin

"WE WENT INTO A TAILSPIN—SOS —WE CAME OUT OF IT, BUT WERE SURE SCARED. IT WAS A CLOSE CALL. WE THOUGHT IT WAS ALL OFF, BUT WE CAME OUT OF IT. THE LIGHTS ON THE INSTRUMENT BOARD WENT OUT, AND IT WAS SO DARK THAT BILL COULDN'T SEE THE...WE ARE IN ANOTHER—SOS—"

In the middle of the sentence the wireless transmitter was stilled and two more ocean flyers, Erwin and Eichwaldt of the "Dallas Spirit," had plunged into the Pacific while bound for Hawaii seeking traces of two lost planes. For the first time the occurrence of a dreaded tailspin had been actually reported at the moment it happened. That was in 1927, and the same year forty per cent of all the fatal accidents to army planes were due to spins. In the last five years forty-five per cent of navy airplane accidents have been due to the same cause. The figures were compiled by Lieut. Carl Brown Harper, U. S. N., who has been making a study of spins, their causes, and means of preventing them. Why a spin is so dangerous is easily told. The inner ear is affected, the waterlike liquid which it contains, is set in motion, nerve impulses are transmitted to the brain, and from there down to the eyes, and the eyes begin to oscillate from side to side. The pilot, realizing he is in a spin when the stick tries to force its way back into his chest, shoves it forward and applies opposite rudder to bring his ship out, but having done so his eyes continue to oscillate, until they make him believe he is still in the spin, with the result that he keeps on holding the stick forward and the rudder over until the plane goes into a second and opposite spin. But, more dangerous still, the pilot, even when provided with a parachute, cannot leave his ship during the spin, because centrifugal forces during the gyratory movement have multiplied his weight by four. The only way he could escape from his craft would be through a trapdoor in the floor, and the navy is now studying that problem. An airplane in a tailspin describes an unusual course. Imagine a giant screw, with threads of enormously long pitch and small radius. Hold the airplane with nose down, the propeller against the screw, and the tail sticking upward at an angle of sixty or seventy degrees. Now revolve it around the screw. It describes small circles, because of the small radius, but de-

scends rapidly, because of the great pitch of the threads. That is exactly the course of an airplane in a spin. Spins usually result from trying to climb too fast, with the result that the engine is unable to pull the weight up the steep aerial hill; the speed falls to the stalling point, and, lacking sufficient forward speed to give control, the craft falls off on one wing. Wing slots, small movable flaps curved to fit the leading edge of the wing, can prevent a spin by flapping open and increasing the lift on the lower wing. The American rights to the slots have been purchased by the government, and experiments are being carried on by the navy to improve their design. One problem has been the necessity of providing some means of locking the slots so the military pilot can render them ineffective when he wants to deliberately spin his ship in fighting maneuvers.

Loading Box Cars in Sweden Is Facilitated by Tops Which May Be Removed as Shown Below

THREE TESTS FOR OLD RUGS

Rug collectors hunting old and valuable pieces are given three simple tests by an English expert, to determine rug quality. A wet handkerchief rubbed over the rug will determine if the colors are fast. If the color rubs off on the handkerchief the design may be spoiled. Examining the inner strands determines if they are of the same color as the outer ones and if the design extends through the thickness of the rug, and a marked sheen or dull polish to the fiber usually indicates that the rug is more than fifty years old and so of good value. Lastly, the rug should be examined for moths, cuts, or worn places.

BOX CAR WITH REMOVABLE TOP ENABLES EASY LOADING

Top-loading freight cars with removable roofs are being used by a railway in Sweden, it having been found that when package-loaded by derricks, they can be filled much more rapidly and easily than the side-loading type. The cars also retain the side doors for service when equipment is not available for lowering freight from above into the car. The roof is divided lengthwise in two quadrant-shaped segments which can be let down, one on each side. A shaft along the top of each car side with pinions at the ends works on a gear rack under the segment and is connected through a bevel gear to a vertical shaft which has at the bottom a worm gear with a crank that is easily reached from the ground.

¶Coal can now be rendered dustless by the use of certain chemicals sprayed on it.

Two Views of a Self-Dumping Scow Operated by Flooding Air Chambers, Whereupon the Bottom Becomes the Top for the Next Load

SELF-DUMPING SCOW CAPSIZES AND BOTTOM MAKES DECK

Scows of 800 tons' capacity which unload automatically by overturning, whereupon the bottom of the loaded barge becomes the deck for the next load, are being used successfully in excavating operations in Seattle. The top and bottom of the self-dumping barges are identical and the sides are built up for holding the dirt, while inner wooden tanks on either side serve the purpose of flooding. The load forces the air-tight chambers beneath the water line. A one-man tug tows the scow to deep water, the tug operator pulling open the valves on one side with a line. This shifts the center of gravity as the water rushes into the opened chamber, and the scow overturns. Dumping of the load raises the air chamber above the water line and the water runs out. With the valves closed, the scow is ready for the next load. Unloading is accomplished in less than four minutes, the tug continuing on its course as the scow is overturned.

BLACK FENCE POST TURNS WHITE EVERY NIGHT

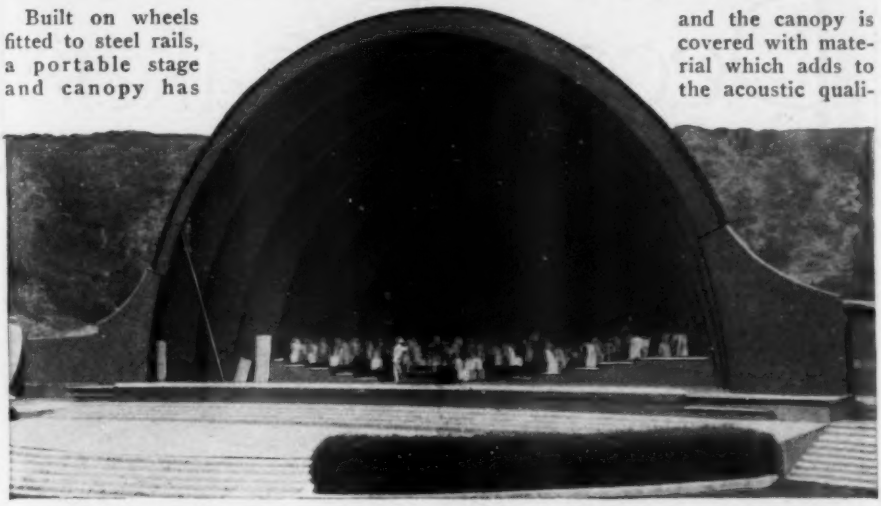
A man's puzzlement over a fence post, which he had painted black but which turned white every night, was the starting point of a program of research which has culminated in the discovery of a number of chemicals having this remarkable chameleonlike property, scientifically termed phototropy. The famous fence post was painted with a "pigment having a zinc basis." It would turn black soon after sunrise each morning, only to turn white again when darkness came. Many explanations have been given for the phenomenon but scientists are not yet agreed as to the cause of it. They have, however, found several other substances besides the zinc sulfide, which was in the paint on the post, that will also change color with the light. Most of the known phototropic liquids are solutions of colorless derivatives of certain dyes.

BRAND CATTLE WITH SQUEEZER

Operating like the old-fashioned V-shaped lemon squeezer, a cattle squeezer is being used to expedite stock branding in Nevada. Animals to be branded are driven into the open end of the V-shaped contrivance one by one, after which a lever closes the sides until the imprisoned animal is unable to move and scarcely a minute is required for the branding operation. For dehorning, a headpiece is provided also and is adjusted after the animal no longer is able to struggle. Cattlemen say the "squeezer" more than doubles the daily output of a branding gang.

PORTABLE STAGE ON WHEELS MOVES ON RAILS

Built on wheels fitted to steel rails, a portable stage and canopy has



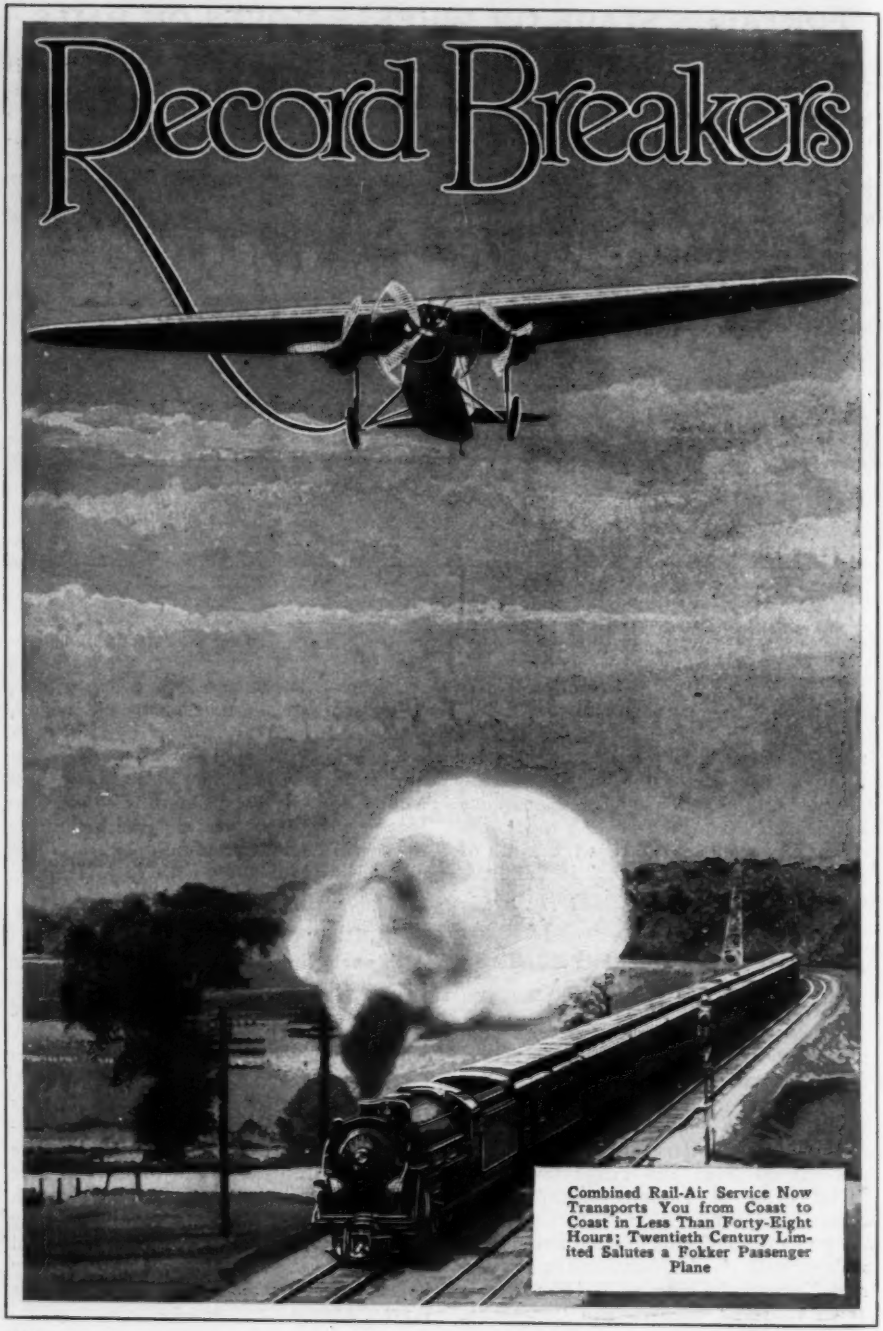
and the canopy is covered with material which adds to the acoustic quali-

Placed on Wheels Which Move along Steel Rails, This Portable Stage for the Hollywood Bowl, with Its Ten Arches Decreasing in Size, Has the Appearance of a Huge Bonnet

been constructed for use in the Hollywood Bowl. The movable stage makes possible a canopy-covered platform for orchestra work and an open stage with natural sylvan background for drama and dancing. The shell consists of a series of ten arches decreasing in size, giving the proscenium somewhat the appearance of a gigantic bonnet. Dressing rooms are provided on each side so that the width of the movable unit is about 120 feet and the depth sixty feet. The framework is steel, ties, while lights are set in the flanges separating each of the series of arches. The structure is supported by wooden girders to which are attached flanged wheels which in turn are supported by steel rails. By means of a small engine, the proscenium unit may be pulled up into a canyon wholly out of view. The only connection between the structure and the ground is the wiring and the plumbing and these may be disconnected with little trouble. A fanlike curtain is used for the canopy.

AIRPLANES REPLACING BURROS IN LATIN AMERICA

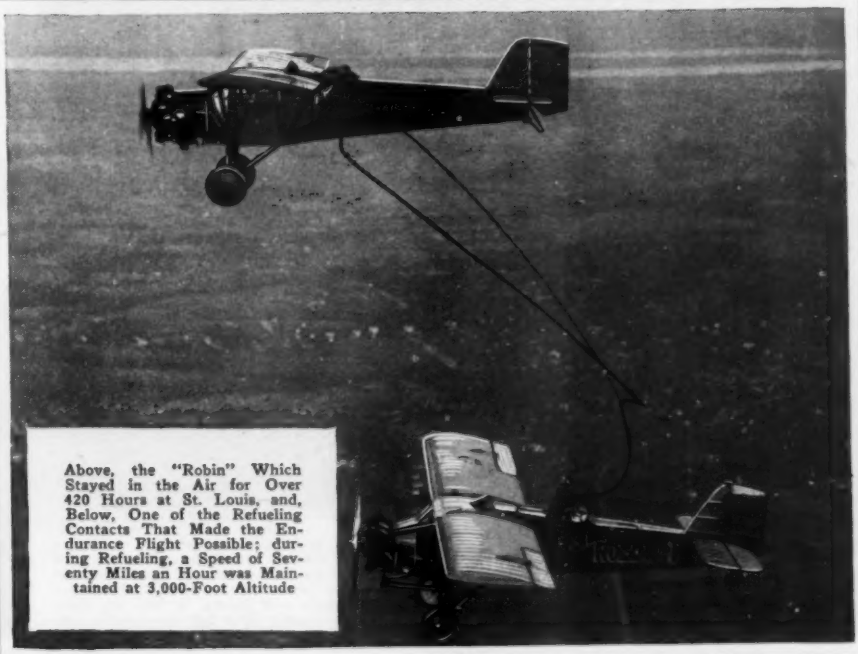
Airplanes are replacing burros and other crude forms of travel as a means of transportation in Mexico and other parts of Latin America. Here today the airplane is being used where before primitive forms of travel prevailed. Air lines extend from the Texas border to the oil fields of Tampico, Tuxpan and Mexico City, while from Vera Cruz one may go to the Isthmus of Tehuantepec or to Tapachula on the Guatemalan border, or to Yucatan by way of the almost unknown coast of Tabasco and Campeche. A branch line is planned from Merida across Yucatan to Cozumel over territory inhabited entirely by hostile Indians, and the Guatemalan government has a line from Guatemala City to Flores. Mexican air lines from Tapachula, in the south, soon will be extended to Guatemala City and mail will go from Texas to Guatemala in twelve hours. From there, the Republic of Salvador and the Pacific side of Nicaragua are to be linked by air with the Atlantic side. At present one may fly from Florida to Santiago, Chile, and before the year is ended, the journey may be continued across the Andes to Buenos Ayres, Argentina



Combined Rail-Air Service Now Transports You from Coast to Coast in Less Than Forty-Eight Hours; Twentieth Century Limited Salutes a Fokker Passenger Plane

Copyright, Ralph Bugh

of the Air Age

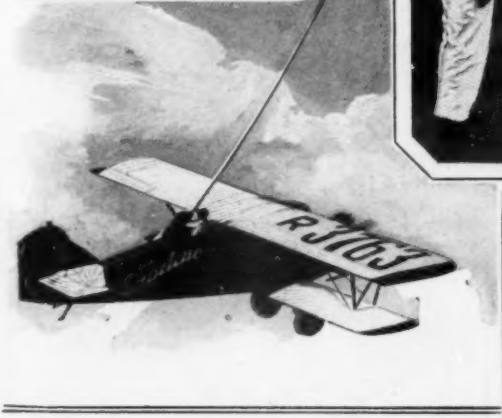


Above, the "Robin" Which Stayed in the Air for Over 420 Hours at St. Louis, and, Below, One of the Refueling Contacts That Made the Endurance Flight Possible; during Refueling, a Speed of Seventy Miles an Hour was Maintained at 3,000-Foot Altitude

Above, the Monoplane "Yellow Bird" on the Beach at Comillas, near the French Border, Where It Was Landed after a Flight across the Ocean from Old Orchard, Maine; at Right, Leo Nomis Testing a High-Pressure Grease Gun Used on His Endurance Flight with Maurice Morrison, Which Ended after Forty-Two Hours When the Ship Crashed

Charles W. "Speed" Holman in the Laird Biplane Which He Flew at the Rate of More Than 156 Miles an Hour over the 468-Mile Course between East St. Louis and Indianapolis and Return, to Win the First Gardner Trophy Race for Commercial Airplanes and a Cash Prize of $5,000

Gasoline, Food and Water Are Necessities for the Successful Endurance Flight and the Refueling Ship and Its Crew Play an Important Part in Keeping the Plane in the Air; Upper Right Shows a Refueling Plane Making Contact over Los Angeles with the Endurance Ship "Angeleno" (Lower Left); in Oval, Capt. Frank Hawks, Who Smashed Records by a Round-Trip Flight from New York to Los Angeles and Return with One Stop for Fuel



Space Is Ever at a Premium in Passenger-Carrying Ships, Particularly When It Comes to Baggage; the Transcontinental Air Transport Planes, Carrying Passengers on the Air Portions of the Coast-to-Coast Rail-Air Route, Solved the Baggage Problem by Providing Space for It in the Wings; Above, Transport Employes Are Loading Bags into the Wing of the "City of Columbus" before the Initial Rail-Air Trip

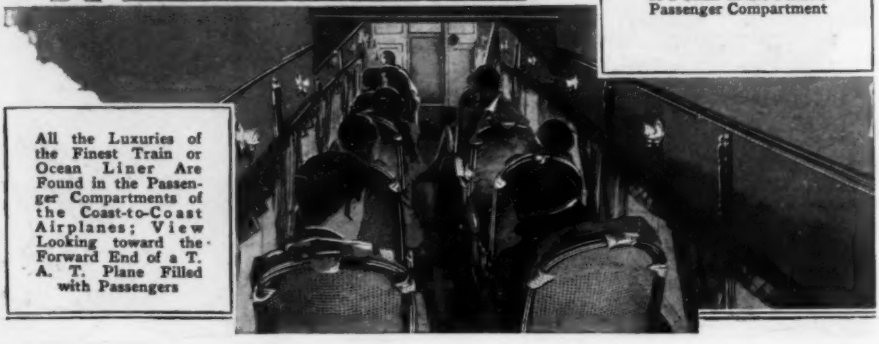
Women Are Manifesting an Enthusiastic Interest in Aviation, as Is Evidenced by Their Use Daily of Air-Travel Facilities, and the Fact That They Have Gone In for Not Only Transatlantic Flights but for Endurance and Altitude Records as Well; Above Is Shown Mrs. Louis Thadden, a California Woman, Who Stayed in the Air over the Oakland Airport for More Than Twenty-Two Hours to Establish an Endurance Record for Her Sex, While at the Left Is Pictured Miss Marvel Crosson, Another California Girl Pilot, Who Took a Cabin Monoplane to an Altitude of 24,000 Feet in an Effort to Set a Record for Height for Other Women Flyers to Emulate

Altitude Flyers Must Carry Their Air Supply Along; Right, Lieut. Apollo Soucek with the Apparatus He Used in His Recent Record Flight

Above, the "City of Columbus" Ready to Take the Air at Port Columbus, Ohio, Thus Inaugurating Coast-to-Coast Rail-Air Service; with Many Notables Taking Part in the Ceremonies, Air Passengers Arrived from New York on the Pennsylvania "Airway Limited" after an Overnight Ride, Walked from the Station under a Canopy to the Hangar of the Transcontinental Air Transport, Where a Plane Was Waiting, and after Flying throughout the Day, Resumed Their Journey Westward by Train in the Evening; Below, One of the T. A. T. Planes Flying over Los Angeles

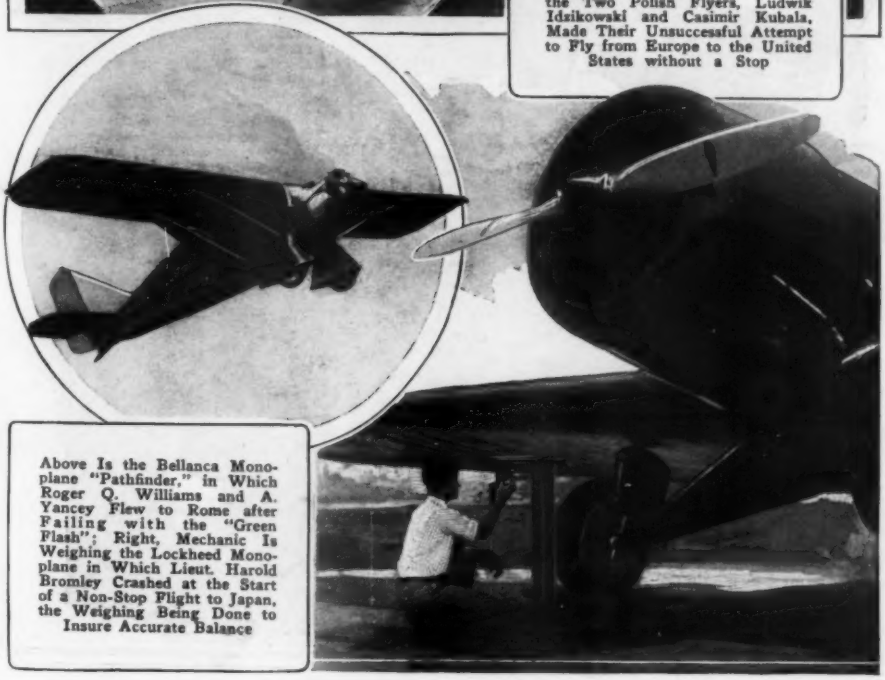
The Map Shows the Coast-to-Coast Rail-Air Route with Shaded Portions Indicating Night Travel by Train and Light Parts the Distances Covered by Air during Two Days; Passengers Leave New York in the Evening, Take Planes from Columbus, Ohio, the Next Morning, Resume Train Travel the Second Night, and Transfer to Airplanes for the Pacific Coast at Clovis, N. M., the Second Day

Coast-to-Coast Rail-Air Passengers Make the Air Portions of Their Journey as Comfortably as in a Pullman; at Left Is a Chair in the Plane's Passenger Compartment



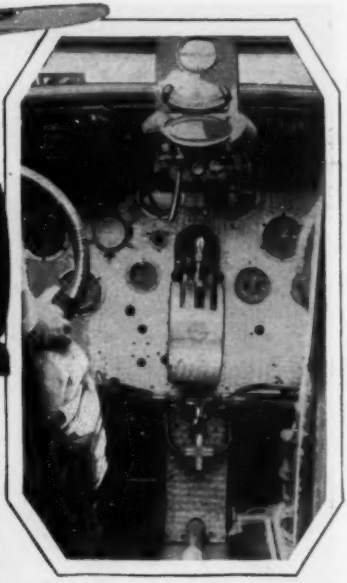
All the Luxuries of the Finest Train or Ocean Liner Are Found in the Passenger Compartments of the Coast-to-Coast Airplanes; View Looking toward the Forward End of a T. A. T. Plane Filled with Passengers

Flights across the Atlantic and Pacific Oceans Still Challenge the Most Daring Aviators of the World; Above Is the Amiot Plane "Marshal Pilsudski," in Which the Two Polish Flyers, Ludwik Idzikowski and Casimir Kubala, Made Their Unsuccessful Attempt to Fly from Europe to the United States without a Stop



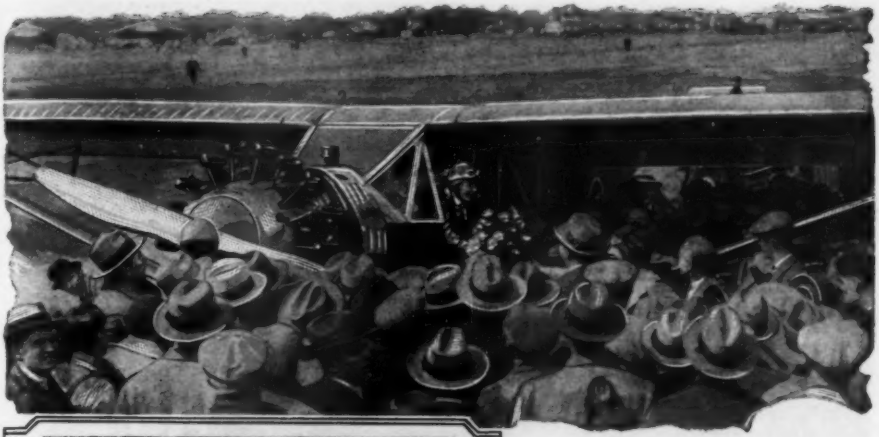
Above Is the Bellanca Monoplane "Pathfinder," in Which Roger Q. Williams and A. Yancey Flew to Rome after Failing with the "Green Flash"; Right, Mechanic Is Weighing the Lockheed Monoplane in Which Lieut. Harold Bromley Crashed at the Start of a Non-Stop Flight to Japan, the Weighing Being Done to Insure Accurate Balance

Above, the French Plane "Yellow Bird," at Old Orchard, Maine, Taking on Gasoline Before It Hopped Off on the Flight Which Eventually Brought It to Paris with the Three French Airmen and an American Stowaway



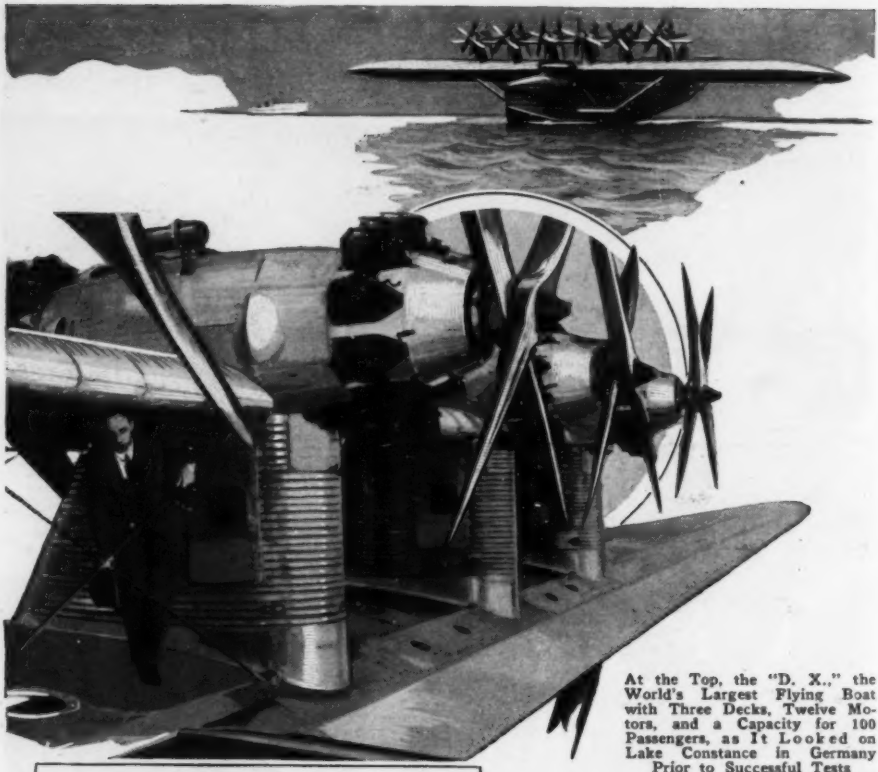
Above, the Instrument Board of the Single-Motored "Yellow Bird" on Which the French Aviators, Jean Assolant, Rene Lefevre and Armeno Lotti, Jr., Relied for Their Successful Transatlantic Flight; Left, Mechanics Repairing a Dump Valve Which Was Damaged during the First Attempt of the Frenchmen to Get Away, Necessitating a Return for a Second Start

This Shows a Close-Up of the Monoplane "Yellow Bird," Being Towed to the Top of the Runway by a Tractor, Preparatory to the Successful Transatlantic Flight of the French Flyers, After the Ship Had Made a Previous Start and Been Forced to Turn Back



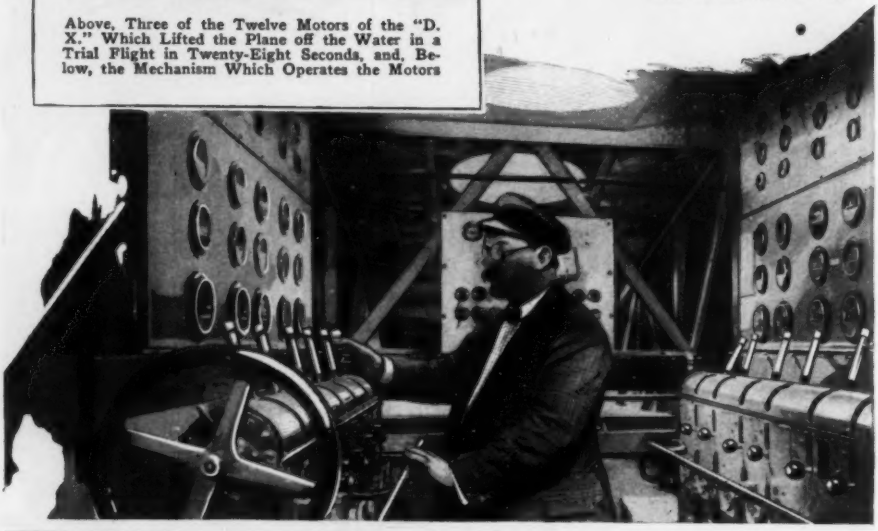
Above Is Shown the Crowd Welcoming Miss Eleanor Smith, Nineteen-Year-Old Girl Aviator, Seen Leaving Her Plane at Roosevelt Field, Long Island, After Making a Solo Endurance Flight of Twenty-Six Hours and Twenty-One Minutes to Better a Mark Set by a California Woman

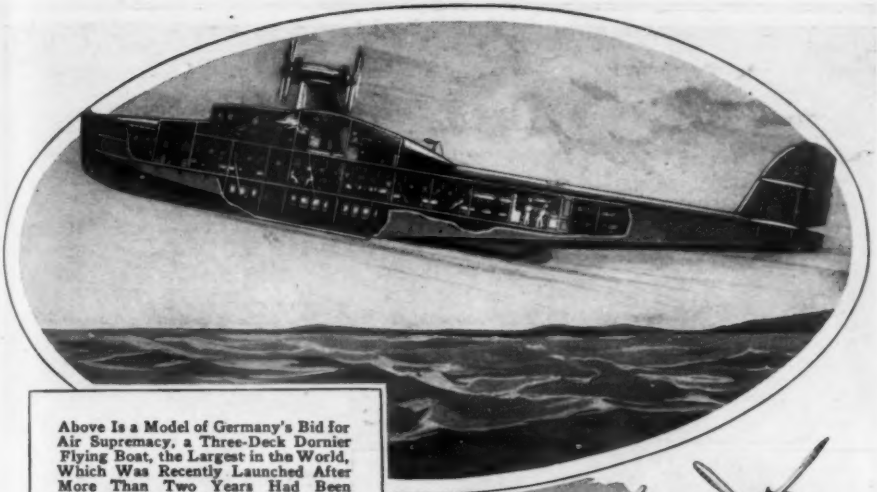
Right, a Smiling Close-Up of Miss Smith Before She Started on Her Solo Endurance Flight, While Above Are Shown Two Other Endurance Flyers, Pete Reinhart and Loren Mendell, Who Flew over Los Angeles in the "Angeleno" to Make One of the Several Endurance Records Established in the Last Few Months, Only to See Their Mark Shattered a Few Weeks Later



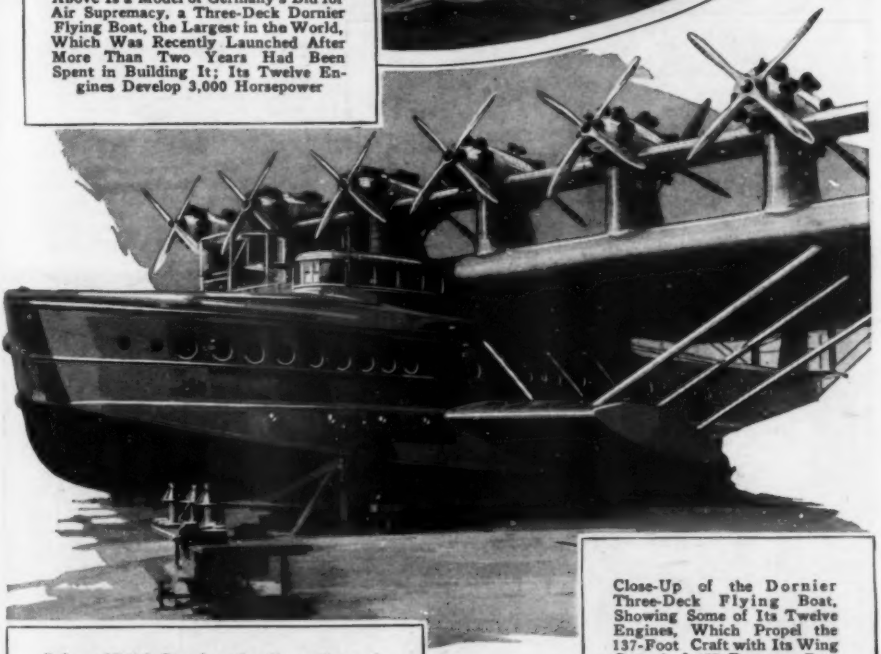
At the Top, the "D. X.," the World's Largest Flying Boat with Three Decks, Twelve Motors, and a Capacity for 100 Passengers, as It Looked on Lake Constance in Germany Prior to Successful Tests

Above, Three of the Twelve Motors of the "D. X." Which Lifted the Plane off the Water in a Trial Flight in Twenty-Eight Seconds, and, Below, the Mechanism Which Operates the Motors



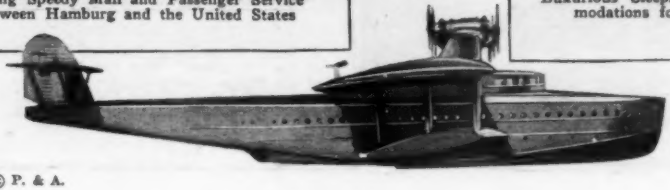


Above Is a Model of Germany's Bid for Air Supremacy, a Three-Deck Dornier Flying Boat, the Largest in the World, Which Was Recently Launched After More Than Two Years Had Been Spent in Building It; Its Twelve Engines Develop 3,000 Horsepower



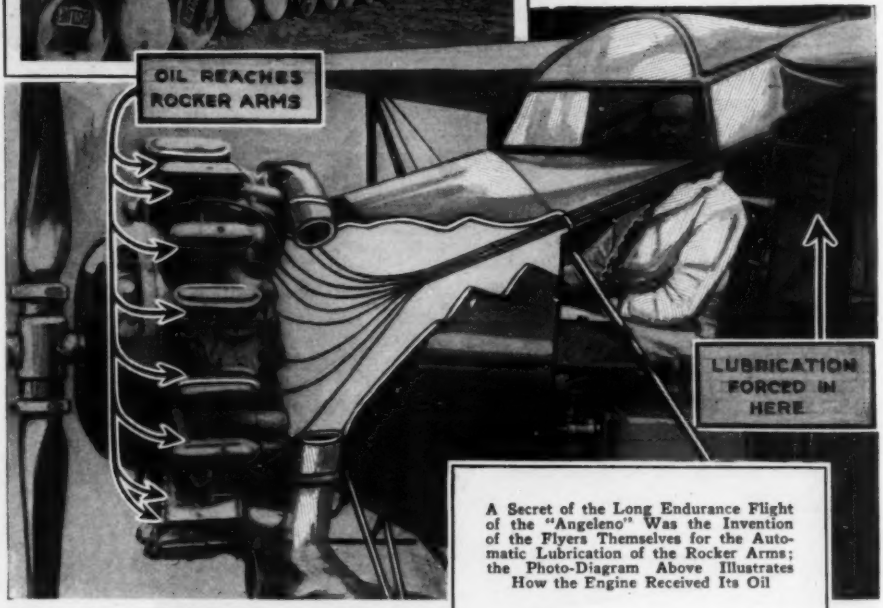
Close-Up of the Dornier Three-Deck Flying Boat, Showing Some of Its Twelve Engines, Which Propel the 137-Foot Craft with Its Wing Spread of 157 Feet at a Rate of 155 Miles an Hour; the Craft Can Carry 100 Persons and Has Salons and Luxurious Sleeping Accommodations for Sixty

Below, Model Showing the Proportions of the Dornier Craft; the Gigantic Air Liner Is the First of Several Huge Craft Which Are Being Planned with a View to Establishing Speedy Mail and Passenger Service between Hamburg and the United States

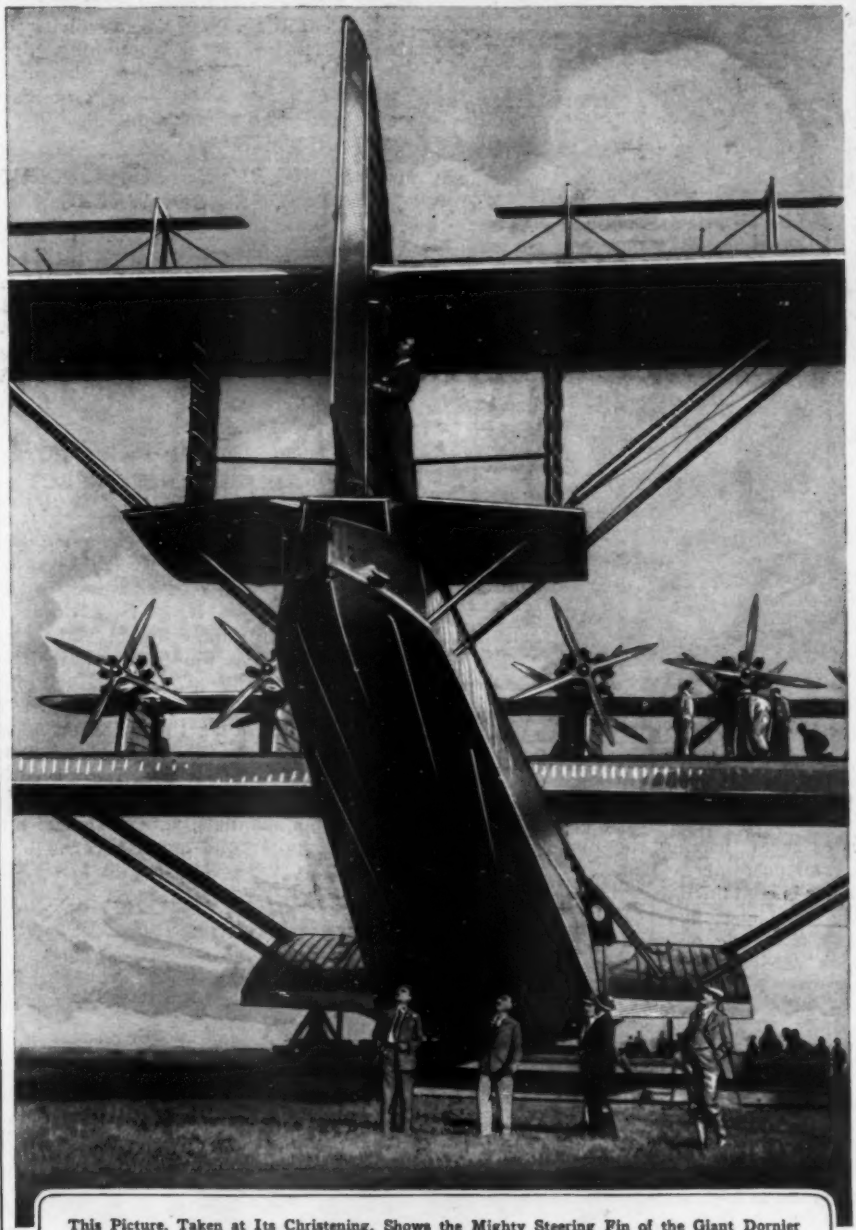


Top Photo © P. & A.

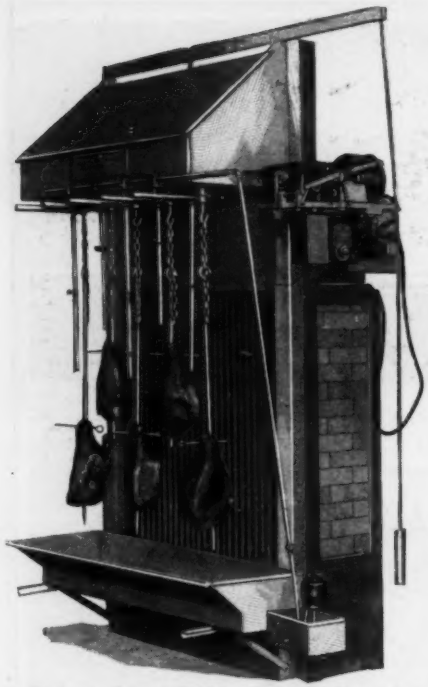
The Map Above Indicates the Distance the Los Angeles Endurance Flyers, Mendell and Reinhart, Would Have Traveled around the World in Their Plane, the "Angeleno," If They Had Flown Straight East Instead of Hovering over the City; Following the Los Angeles Parallel They Would Have Crossed the United States, the Atlantic Ocean, All of Europe and Part of the Pacific Ocean, or Nearly 18,000 Miles; at the Left Are Some of the Empty Gasoline Cans Used by the Ship



A Secret of the Long Endurance Flight of the "Angeleno" Was the Invention of the Flyers Themselves for the Automatic Lubrication of the Rocker Arms; the Photo-Diagram Above Illustrates How the Engine Received Its Oil



This Picture, Taken at Its Christening, Shows the Mighty Steering Fin of the Giant Dornier Plane Built in Germany, the World's Largest; Its Size May Be Estimated by Comparing It with the Persons on the Ground; Its Twelve Motors Will Carry a Load of 100 Passengers, and It May Be Used as an Air Liner between Germany and America



A Barbecue Roaster Which Turns the Meat Automatically, Saving Labor and Meat Shrinkage

AUTOMATIC BARBECUE ROASTER SAVES MEAT AND LABOR

Operated automatically, a barbecue roaster for the roadside stand cooks and bastes meat, leaving the owner free to wait on customers. The roaster is contained in an all-metal house, and the roasts are hung on spits which revolve in a vertical plane in front of an open coke fire, an electrically operated mechanism keeping the meat turning at regular intervals. The basting reduces the shrinkage, which, in ordinary methods of roasting, sometimes runs as high as fifty per cent. A time clock attached to the electric motor rings when the roast is finished, and a safety curtain suspended before the fire descends if the roasts quit revolving or the mechanism stops functioning, thus preventing burning or spoiling the meat. Twenty chickens or 150 pounds of meat may be prepared at one time.

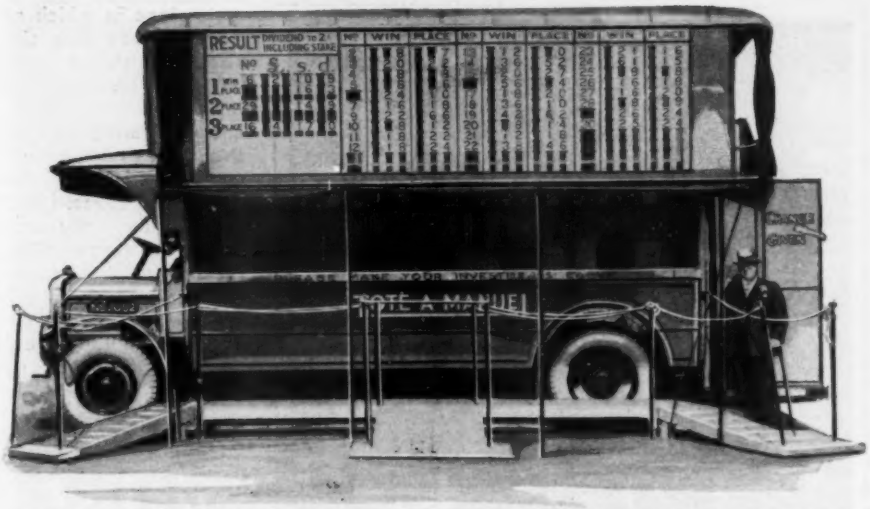
INFLATING BIG BRITISH AIRSHIP REQUIRES SIX WEEKS

Inflating the gas bags of Great Britain's latest airship, the mammoth "R-101," under construction at the Cardington Royal Airship works, lasted more than six weeks. The big bags above the passengers' quarters were first filled and more than two months' production of the works' gas plant was required.

ELEVENTH FINGER FOR ORGAN GIVES ADDED TONE EFFECT

Deciding that the ten fingers of the hands and all the stops on the modern pipe organ did not suffice to produce the blend of sound of which the instrument is capable, a New York organist uses an eleventh finger manipulated by moving his head. This mechanical digit consists of a band fitting snugly about the head, to which is attached a rod curved downward at the end and long enough to reach the third or fourth manual. The organist uses the eleventh finger to sustain or play a melody on one of the upper manuals, and his hands for variations and second-touch effects.

Curved Rod Fastened to Headpiece Provides Eleventh Finger for the Organist



The Lower Part of This Betting Machine on Wheels Is Composed of Booths Where Wagers May Be Placed, While on the Roof Is a Quick-Totaling "Pari-Mutuel" Machine

BETTING MACHINE ON WHEELS PLEASES RACE FANS

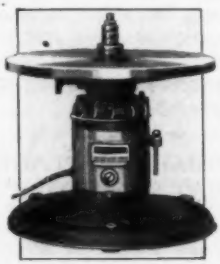
English racing fans are hailing a portable quick-totaling "pari-mutuel" machine carried on the top of a truck, the lower section of which is given over to the wagering. Tickets on horses are issued and from each side of the car the turf enthusiasts immediately see the totals on the big adding machine, which the inventor calls a totalisator.

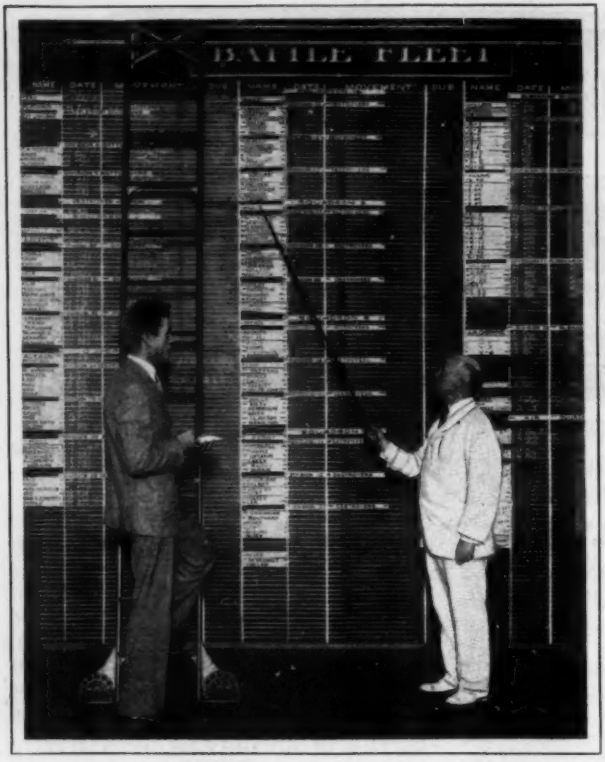
STEAM TURBINE FOR AIRPLANE TO REDUCE COST

Steam may enter the air as the source of power for extra-large airplanes, as plans have been prepared for a steam turbine for aviation by Swedish engineers at the request of an American manufacturer. By using a high-pressure boiler fired with crude oil and a high-speed turbine, the Swedish engineers expect to develop from 2,000 to 10,000 horsepower, a single boiler supplying steam for two turbine units geared to as many propellers, or two boilers for four propellers. Already the weight of these turbines has been reduced to less than two pounds per horsepower, which is about the same as the weight of gasoline engines now used on planes, and less than that of the recently developed Diesel engine for aviation. The weight of the fuel required to make steam would be greater than in internal combustion engines, but the cost would be less as lower grades of crude oil would be used. The steam would be condensed and returned to the reservoirs.

SHAPER FOR THE SMALL SHOP IS EASILY CARRIED

Intended for the small cabinet or carpenter shop, and for schools, a portable electric wood shaper has been placed on the market. It is upright, direct motor-driven, beltless and ball bearing, and so designed that lubricants cannot reach the motor. The table is mounted on a screw on which it raises and lowers, and the spindle has a capacity of two and one-half inches between two steel shaper collars, or three and one-quarter inches, using solid cutters. A combination guard and fence is part of the equipment.





Uncle Sam Keeps Daily Tab on the Location of Each of His Fighting Vessels by Means of This Ship Chart

SHIP CHART SHOWS POSITION OF NAVAL VESSELS

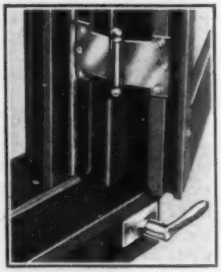
Uncle Sam keeps daily tab on the exact location of every ship in the fighting fleet by means of a huge blackboard in the naval-operations office at the navy department in Washington. The ship chart, or location board, shows the daily battle-fleet maneuvers so that, at any given time, the department knows where each one of its fighting vessels may be found.

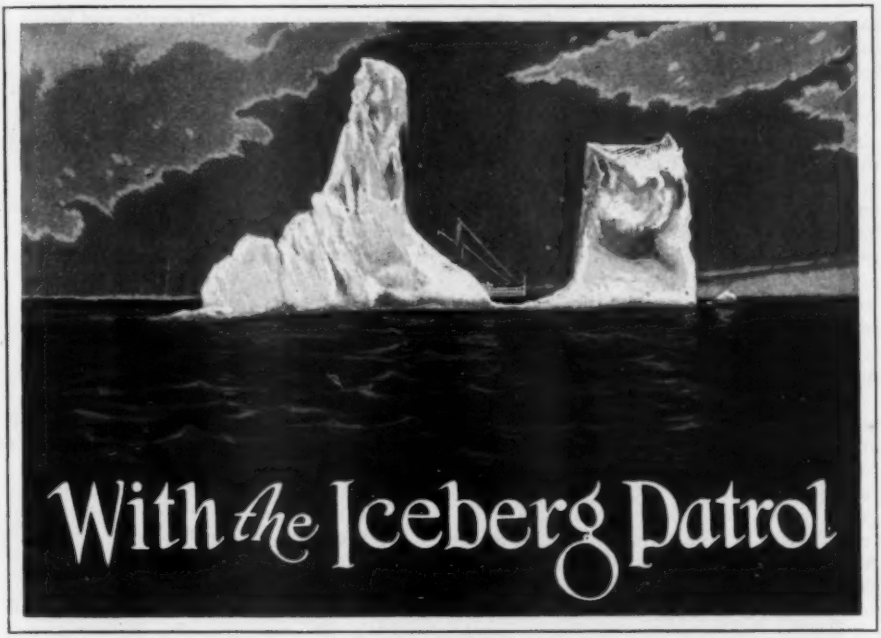
UPKEEP OF A SMALL AIRPLANE SAME AS THAT OF AUTO

Upkeep of a small airplane compares favorably with the operating cost of an automobile, on the basis of distance covered, an official of a flying service has decided after a demonstration trip in a monoplane in which expenses were less than three cents a mile. The flyer covered 17,124 miles and visited fifty cities. During the trip the ship was flown in 330 demonstrations by 108 pilots who covered 9,278 miles, while cross-country flights accounted for the rest of the distance, the ship landing and taking off 410 times and carrying 656 passengers. Gasoline, oil, storage, service repairs and all incidentals totaled $456.61. The flying time was 174 hours and thirty-six minutes, the cost per hour being $2.61. The average speed was about ninety-eight miles an hour.

CASEMENT LOCK IS BURGLAR-PROOF

Depending on gravity and an eccentric pin for security, a casement lock has been made that cannot be opened from the outside while the same principle is applied to make the casement itself water-tight. The window, when closed, is made water-tight by a rabbeted stool and tongue-and-groove machining for the meeting sides. An eccentric pin in the operating handle, placed below the window sill, raises the casement out of the lower groove so that the window may be opened fully inward. A slotted guide in the handle allows for both horizontal and vertical motion of the casement. When closed, the casement drops into the bottom groove as the eccentric pin releases it when the handle is turned.





With the Iceberg Patrol

By EARL CHAPIN MAY

ONE night in April, 1912, the palatial "Titanic" on its maiden voyage struck an iceberg near the Grand Banks of Newfoundland. More than 1,500 human beings lost their lives in the greatest maritime disaster of the century.

Since that tragedy no transatlantic liner has collided with an iceberg. Complete avoidance of collision between fast-steaming ships and wandering remnants of Greenland's glaciers is due to the efficiency of the International Ice Patrol for which the United States coast guard is responsible.

From the first of each April to the last of June, the offsprings of the Greenland ice cap slide into Davis strait and Baffin bay, float southward with the Labrador current and, between Newfoundland and the neighboring Gulf Stream, become menaces to shipping. To avoid this danger, ships between Europe and America have been run in "traffic lanes." They began doing it when 300 people lost their lives by the collision of two ships off Cape Race in the early seventies. Since then, eastbound liners are allowed to cruise only in a lane sixty miles wide from north to south; westbound liners keep in their own lane just north of this.

Since the "Titanic" disaster, United States coast guard cutters, have often shifted these travel lanes to keep liners away from drifting icebergs. The cutters direct shipmasters by radio. If captains ignore warnings, they are disciplined by ship owners. The ice patrol knows its business because it makes a scientific study of icebergs.

Ice patrolling is a risky business. It offers plenty of variety. For example, the number of menacing bergs varies in size and number annually. About 350 of them get south of Newfoundland each spring—on the average. Yet, in the year of the "Titanic" disaster, 1,200 were identified in shipping lanes. Some have been seen as far south as the Azores, but they seldom last more than three days when they get into the warm Gulf Stream.

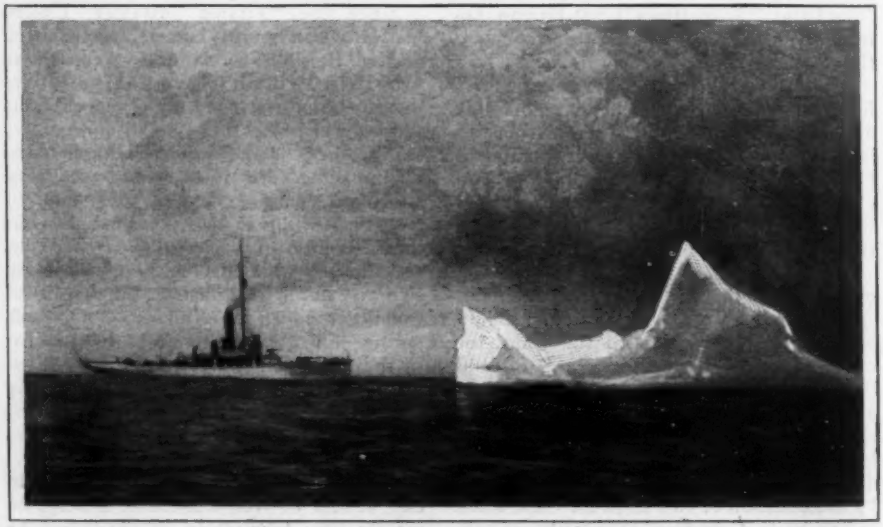
Once spotted, as it rounds the southeast corner of Newfoundland, a berg, no matter how formidable, is shadowed by a coast-guard cutter. This is relatively

easy in fair weather. When a fog shuts down, human eyes are valueless in iceberg hunting. I've known a patrol boat to sight a block of ice 1,700 feet long and, though only sixty-five feet high above the water, weighing some 36,000,000 tons. Just as the cutter approached to make more detailed examinations, a fog has shut down and the 1,700 tons of ship has had to feel its way about. Testing temperature of air and water does not give sufficient warning of a berg's location. On one occasion the "Mojave" found the water registering sixty degrees from a distance of two miles to within one hundred feet of a berg.

Each year the coast-guard cutters study and plot berg-carrying currents over an area equal to that of Pennsylvania. Current plotting is done by comparing subsurface temperatures. When a coast-guard vessel is "dead" in the water, the crew lowers a fine wire into the ocean. At intervals, marking water levels, a bottle is attached. There are usually seven bottles between the surface and the greatest depth, 750 meters. After this length of line is payed out a weight, called a "messenger," is dropped down and successively trips each water bottle, causing it to fill, while a thermometer records the water's temperature. The wire and bottles are then hauled on board, the bottled water siphoned into an electric salinometer and the saline contents or solid salts measured accurately. Temperature and salinity are then converted into terms of specific gravity, and the currents are calculated from the latter. Having determined the drift of current and made due allowance for wind drift, the ice-patrol ship commander can come pretty close to telling where a berg will be twelve hours hence. He can also tell by observation and experience how much the berg will lose from erosion by waves and from melting.

Many attempts have been made to aid nature in disintegrating dangerous icebergs. Coast-guard cutters are well armed. Five-inch guns are carried by most of them. These five-inchers have bombarded icebergs without any effect on the mass of ice. Fifty-pound guncotton mines were equally ineffective. Only currents, wave erosion and warm water can put the floating islands out of business.

The protection given shipping by patrol ships is 100 per cent valuable partly because of radio. Hundreds of weather reports are sent and received. If any vessel wants special information, the cutter promptly radios it. Each spring about



The U. S. S. "Mojave," Having Located an Iceberg, Proceeds to Take Measurements as to Its Speed of Drift, Determined by the Ocean Current and, to a Degree, by the Wind

Plunging through a Heavy Sea on an Iceberg Hunt; the "Mojave" Forges Ahead in All Sorts of Weather, to Guard Other Vessels against the Iceberg Menace

300,000 words are thus handled. Ship masters have learned to respect these warnings. In summer time, New York-Europe liners, cruise over what are known as courses A and B. From September to February 1, they cruise on courses C and D. During the normal ice season, from March until June, they may be shifted, upon recommendation of the ice patrol, from track B to track A, if the drift of ice is extra southerly.

One night last May, the "Aquitania" was running at a speed of twenty-two and a half knots across the Grand Banks. Her course, as given to the coast-guard cutter, indicated that she was headed toward the position which would soon be taken by the southernmost berg. She was also headed into a fog. The cutter gave her a special warning, then broadcast information about the drifting berg. The liner promptly altered her course—and proceeded safely. The thousands on board the "Aquitania" knew nothing about the cutter's work.

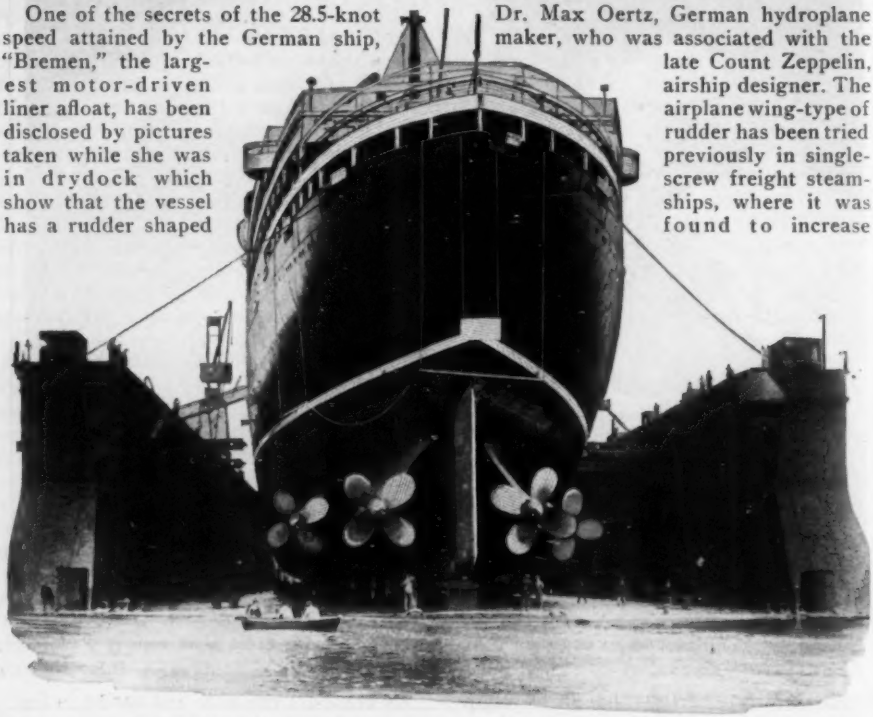
By ceaseless vigilance and daring in fog, wind and cold; by weeks of cruising in dense fog; by long days and nights on the bridge with the fog whistle blowing double blasts at two-minute intervals so that liners may keep clear of them, the patrol boats keep safe the great transatlantic lanes of travel.

GOLF-BAG CONTAINER FOR CAR HELD ON RUNNING BOARD

Stowing golf bags in an automobile is simplified by a holder which is attached to the running board. The outfit has a capacity of four bags, is chromium-plated and can be detached easily when it is not wanted.

RUDDER SHAPE SECRET OF GREAT LINER'S SPEED

One of the secrets of the 28.5-knot speed attained by the German ship, "Bremen," the largest motor-driven liner afloat, has been disclosed by pictures taken while she was in drydock which show that the vessel has a rudder shaped like the wing of an airplane, on the streamline principle. The streamline rudder of the fast 50,000-ton ship, navigators explain, increases effectiveness in steering, and reduces eddies and currents which interfere with the propellers, thus minimizing resistance to the speed of the boat. The rudder was designed by Dr. Max Oertz, German hydroplane maker, who was associated with the late Count Zeppelin, airship designer. The airplane wing-type of rudder has been tried previously in single-screw freight steamships, where it was found to increase speed from four to eight per cent and to save ten to fifteen per cent in fuel. The "Bremen," however, is the first passenger ship to be so equipped, and if the airplane rudder continues successful on this vessel, it may be adopted by other ships which deem speed and fuel-saving essential to successful operation.



Here Is the German Liner, "Bremen," Fastest Steamer Afloat, in Drydock Before Her Record-Breaking Trip to America; Note the Propellers, and the Rudder Shaped Like an Airplane Wing

ARE YOU RIGHT OR LEFT-EYED SHOWN BY TESTS

Are you right-eyed or left-eyed? This question is settled by a vision test through which an experimenter may determine whether an individual looks with the right or left eye. The test is so simple that it can be tried on children, and groups can be tested at one time. In sixty-five per cent of persons the right eye is dominant, thirty per cent are left-eyed, and five per cent have mixed vision. About fifty per cent of left-handed persons have been found to be left-eyed, and the relation between eyes and hands is considered significant, but still obscure. Double vision, the inevitable outcome of having two eyes, is overcome by ocular dominance in which the right of way is given to the image of the dominant eye, that of the other eye tending to be suppressed.

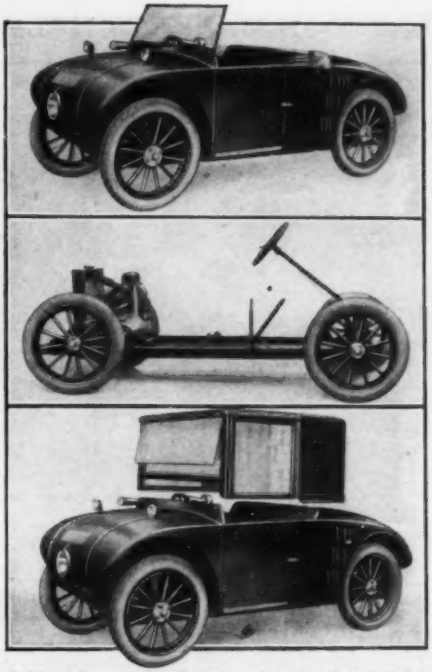
NON-LIQUID STORAGE BATTERY REDUCES MOTOR TROUBLES

Filled with a solidified sulphuric-acid solution, instead of liquid, a storage battery now on the market requires distilled water but once every three months. It prevents the formation of injurious substances, eliminating the likelihood of burned plates, and the battery cannot freeze under any conditions. Taxicab companies claim it reduces their battery costs nearly fifty per cent a year.

AERIAL CAMERA SHOWS DETAILS OF GROUND FROM ALOFT

Successful tests recently were made at Dayton, Ohio, with the world's largest aerial camera which weighs 130 pounds. The film is 150 feet long and nine and one-half inches wide. An instrument times the interval at which the photographs are to be taken and trips the camera shutter. The film is wound automatically and a registering apparatus notes the altitude of the plane, the time of day, the date and the number of the negative. The camera is electrically heated so it will function in low temperatures. The first photograph taken was from an elevation of 18,300 feet. The possibility of obtaining colored motion pictures from the air also was demonstrated with another camera. The value of the color pictures from a military standpoint thus far has been limited because of their small size, but experiments are being made with a view to producing larger pictures.

World's Largest Aerial Camera Which Gives Ground Details at 20,000 Feet



A Light German Car Constructed with a One-Cylinder Engine, and the Motor in the Rear

SINGLE-CYLINDER AUTOMOBILE HAS MOTOR IN REAR

Built with a one-cylinder engine and the motor in the rear, a light and compact automobile turned out by a German manufacturer presents a strange contrast in appearance to the American car. Aside from the reverse position of the engine, the body itself is original in design. A coupe has a removable top, and a single-seated car designed for a cab has the passenger's seat beside the driver with a glass panel separating them. A single light is built into the middle of the hood, and the body itself is contoured so as to form the fenders.

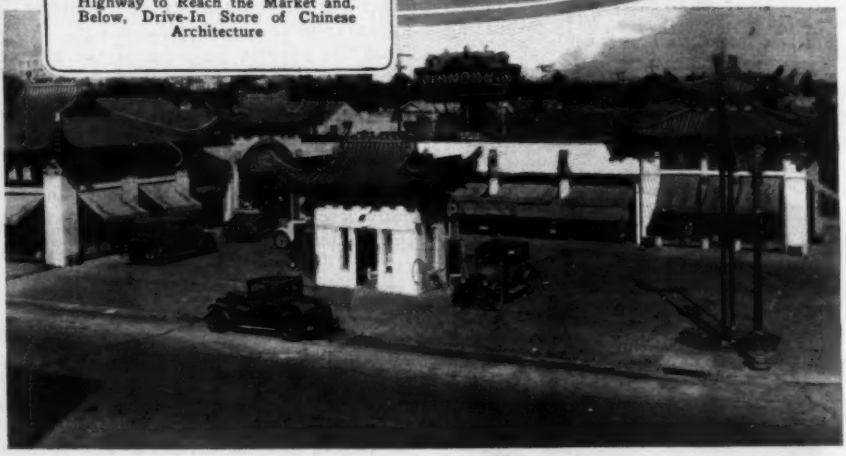
PLANE SMOKERS START FIRES

Lighted cigar and cigaret stubs thrown from airplanes may start forest fires, forest rangers have determined after a series of tests. As a result, forestry officials have issued warnings to pilots and air passengers against throwing any sort of burning material from the ships.

DRIVE-IN MARKETS HELP SOLVE TRAFFIC PROBLEM

Drive-In Markets to Accommodate the Motorist; This One Is Built in Spanish Style to Harmonize with Surrounding Residential Section and Helps to Solve the Parking Problem

Showing How Easily Cars Leave the Highway to Reach the Market and, Below, Drive-In Store of Chinese Architecture



FORGED STATUARY IS DETECTED BY VIOLET RAY

Ultraviolet rays are being tried out by the Metropolitan museum of art to supplement the connoisseur's "sixth sense" in detecting fake marble antiques. In the past, X-rays have been tested with some success. Museum officials who are using the ultraviolet ray on marble said it has possibilities which are not limited to this field alone. The use of the rays is made possible because objects exposed to this light tend in varying degrees to reflect the purple rays. Experiments have shown that the color of old marble under the rays was different from that of freshly cut marble, as its luminescence was of a different color.

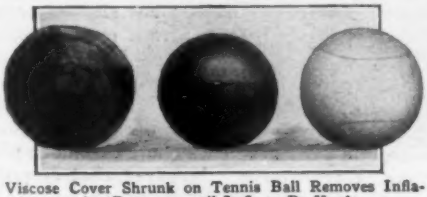
Race Horses Must Have Sound Hearts, and the Machine Pictured Utilizes Light Rays to Test the Thoroughbreds

ROUND SAW TO CUT PLASTER

Intended particularly for cutting plaster or artificial stone, a round saw blade has barbs cut about its circumference and is used in an ordinary hacksaw handle. It cuts rapidly and may be used for circular or irregular designs where it does not fracture the work. It is useful in making ornamental articles from plaster.

TENNIS BALL SEALED FROM AIR UNTIL READY TO USE

Tennis balls are kept fresh and preserved from deadening by a viscose cover that is shrunk onto the ball, contracting it and removing the inflation pressure from the walls. The cover also seals the ball, preventing air and moisture from oxidizing it. The seal is removed by running a cutter under the seam, and, when bounced, the ball resumes normal shape and size.



Viscose Cover Shrunk on Tennis Ball Removes Inflation Pressure until It Is to Be Used

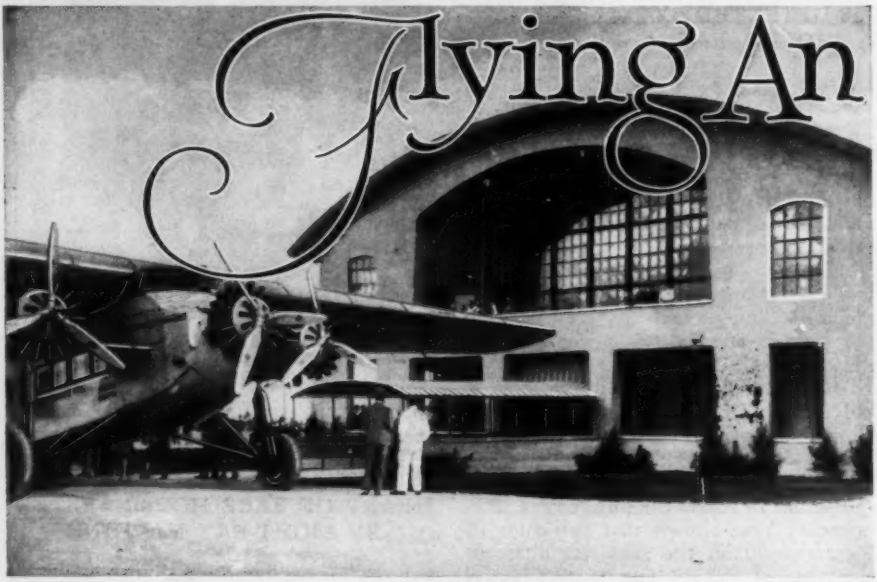
HEART OF RACE HORSE TESTED BY LIGHT-RAY MACHINE

Race horses, like boxers, must undergo a physical examination to determine their fitness for competition, including for yearlings, a heart test for congenital abnormalities or other disorders. An official of the thoroughbred institute has made a device which utilizes light rays to determine the racer's soundness of heart. The machine somewhat resembles a radio set.

"DRY ICE" CAUSE OF INJURIES

One of the latest hazards in connection with the development of new industrial processes is that arising from the use of "dry ice," says the department of labor. Dry ice is used by ice-cream plants and dairy companies to pack their products, having an estimated temperature of 110 degrees below zero and being capable of producing a serious injury if carelessly handled. The ice, made from carbon dioxide, is delivered as cubes which are shaved into small pieces to suit the users. Handling the ice with bare hands, despite warnings, has resulted in the injuries.

Flying An



Pan-American Airport Station and Typical Tri-Motor Ship with Its Three-Bladed Propellers; Note the Covered Passenger Lane and the Roomy Observation Platform

By J. EARLE MILLER

PART II

"WHEN it's rough aloft," says a recent advertisement, "or the report says dirt above the Alleghenies . . . or ice and fog over the Hump . . . then only master pilots should take to the skyways."

How to become a master pilot is a problem that is engaging the attention of a large part of the youth of America.

One of the largest factories has its own system, which consists of taking men with hundreds of hours of solo experience, starting them in the factory bucking rivets, and putting them through every branch of the work of building an air liner, with a finishing course of flying the ship. Five hundred hours as a pilot is the minimum requirement for entering the school. How to get that 500 hours, or how to work up the hours required for any of the better-paying pilots' posts, is the problem.

Training pilots has undergone a remarkable change in the last year. Government regulations are getting more stringent all the time, and the men behind the air lines and behind the companies that manufacture planes recognize the importance of creating competent flyers. A plane can be built in a few days, even the big tri-motored air liners are turned out daily, but it takes not only months but years to make a finished pilot.

The Ford-Stout company has made a rule that it will not sell a plane for use to anyone except a pilot it has approved, or one that has graduated from its school. An accident involving the lives of twelve or fourteen passengers, a pilot and mechanic, as well as some $70,000 worth of airplane, is too serious a matter not to warrant every possible measure to avoid it, and insistence on the adequate training of pilots is the one way the manufacturer has of protecting the reputation of his aircraft.

There are more planes flying every day, however, that do not require the skill and training of an air-line pilot, and it is

Air Liner

Fokker Flying Yacht with Dual Hull, Interior of the Craft's Luxurious Cabin and, Below, Anthony Fokker Leaving the Ship

through them the young flyer has a chance to work up to the more important jobs. It is like training as fireman and then engineer on a freight train, then engineer on the local as preparation for pulling the throttle on the Century or the Broadway Limited.

The planes which take the place of the railroad freight and local are the private ships owned by business men and manufacturers, and flown, either to carry important executives about the country or for delivering express and freight, and advertising the company's product. Most of them are cabin ships, ranging from the pilot and two-passenger craft of the Curtiss "Robin" class, up through the four, five, six, seven and eight-passenger—the Alexander "Bullets," Stinson "Juniors" and "Detroiters," Ryan "Broughams," Fokker "Universals" and "Super-Universals," and like craft.

The ships in this class are

mainly powered with air-cooled radials, ranging from the light engines of the "Velie" type up through the Wrights and the Pratt and Whitney "Wasps" and "Hornets." Speed and excess power are common in the more expensive jobs, such as the Lockheed "Vega" and "Air Express," which hold the transcontinental speed records.

It is possible to get all the training needed to fly one of these planes, at least to meet the license requirements, without leaving the flying school to get a job. A two-hundred-hour transport license course, including ground school, primary training, solo, and the 200 hours of solo flying, can be had for around $4,000. One school has been experimenting with a 200-hour course in which the student is given a new plane, all for $4,970. In this course the young pilot, after graduation from ground and primary school, gets his first ten hours in a school ship, to qualify for a private owner's license. As soon as he passes the necessary tests for that the school delivers his own ship, and he can proceed to work up the other 190 hours as fast as he wants to. He pays for gasoline and oil and a nominal hangar fee, and the school supervises the condition of the ship and any overhaul and repairs he makes, and provides instructors for check hops at regular intervals, to determine what he is learning and check any tendency to fall into sloppy ways of piloting.

Another school, operated by a manufacturer of light planes, has an even more novel arrangement. Any student who has graduated from the primary school, or has twenty hours in another school, or boasts a private pilot's license, can rent a ship by the month and work up his flying time as fast as he wants to. The school claims it is possible by this system to get in 200 hours of solo flying for about ten per cent of what it has cost in the past. The charge is $90 for the first month, $80 for the second, $70 for the third, and, if the flyer wishes to use a ship thereafter it costs him only $60 a month. The student furnishes the gasoline and pays the insurance premium on the ship, while the school provides the oil. Those prices are basic figures, applying during the month of April. Owing to variations in the amount of good flying weather in the latitude where the school is located, the figures are cut as much as forty per cent in January, thirty-five in February and December, twenty per cent in November and March, and raised from twenty to thirty per cent in the summer months.

Under the new regulations which the

Courtesy Mahoney-Ryan

Man Power Is Still Popular in China, although Airplanes Are Appearing in Various Parts of This Ancient Country; Hauling a Plane to Be Used in Transport Service on Coast

Sikorsky Amphibian Transport Ship Used by Pan-American Airways between Florida and West Indies; the Same Sort of Plane Flies between Catalina Island and the Coast of California over Western Air Express

department of commerce is expected to issue in the fall it is thought that student instruction and commercial flying from the same field will be prohibited, not only because of the danger to the air liners from the presence of inexperienced students, but because the air-line operations delay student instruction.

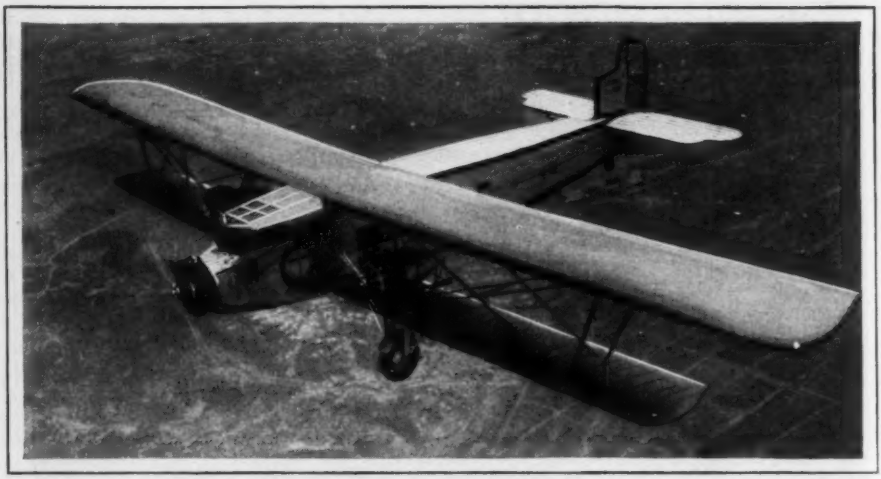
In expectation of this order the larger schools are already taking steps to separate their work from commercial fields. Several of the bigger organizations, with manufacturing, operation and school departments, are acquiring double fields. Several of the schools are emphasizing the necessity of every flying student receiving instruction in both open and cabin planes. Heretofore all pilots were trained in the open-cockpit craft, and picked up their closed ship flying ability after leaving school.

Flying an aerial sedan instead of an open roadster doesn't require anything radically new in education. The pilot must accustom himself to the more limited range of vision, and, as a great portion of the cabin ships are monoplanes, he must learn, if he learned to fly in a biplane, that the monoplanes are, as a rule, more sensitive or "tricky" and require a longer glide to land.

The smaller air sedans have standard stick controls, so there is nothing new to learn in handling them. Every ship feels different in the air, and this may be true of two exactly similar ships of the same make and model. An accomplished pilot can disregard this, for they all take off much alike, and once in the air he can study the response to the controls, the flying and stalling speed and the gliding angle, and then bring the craft in and make a good landing.

The "floating" habit of most monoplanes is the most disconcerting thing about them to the student who graduates from the low-powered, big-winged training biplane. Most of the primary training ships land at anywhere from thirty-two to forty miles an hour, more of them at the slower than at the higher figure. Compared to that even the little Curtiss "Robin" has a landing speed of about fifty miles an hour, with a correspondingly longer roll after the wheels touch the ground.

Landing and stalling speed are the two most important things in a flyer's life.



Specially Designed for High Altitudes Encountered on the Transcontinental Run between Chicago and San Francisco, a Boeing Transport, Powered with Three "Wasp" Engines

They are virtually the same, for a ship stalls at the point where speed falls so low it no longer responds to the controls, and a ship lands within a mile or so of this same speed. Increase the landing speed, and the speed which must be maintained in the air also increases. Many of the training biplanes can be cruised at sixty miles an hour or even less in perfect safety. Raise the landing speed to fifty miles an hour and the safe cruising speed goes up to sixty-five or seventy; raise it to sixty and cruising speed should not be permitted to fall below eighty.

Students usually learn to fly with the minimum of instruments, sometimes nothing but tachometer, oil gauge and temperature indicator. After they have mastered the trick of judging flying speed and flying position by the feel of the ship and the whistle of the wind through the flying wires, graduation to a better-equipped ship comes as a pleasant relief. Given an air-speed indicator to check flying speed, turn and bank indicators to check flying position, and, possibly, a rate-of-climb indicator as a check on climb and gliding angles, there is small chance of a wide-awake pilot getting into an involuntary spin or even stalling the ship.

Every plane is rated by the manufacturer to climb so many hundreds of feet per minute in air of sea-level density. With lighter air at a higher altitude, the climbing rate becomes less, so the climb indicator, which shows the rate not as an angle but in feet per minute, cannot always be relied on. But a check-of-climb indicator against the air-speed dial determines whether the plane is maintaining a safe climbing speed, so one instrument is an aid to the other.

Instrument flying is becoming increasingly important, as air lines must maintain schedules in all kinds of weather, and blind flying through fog and storm is only possible for the pilot who is skilled in the use of his instruments. Because a flying education sufficient to fit a man to pilot one of the big air liners costs considerably more than a college education, and takes as long or longer to acquire, there probably will be a shortage for some years to come of men for the air-line posts.

LUMINOUS CLOTH LURES COONS

Raccoons are curious animals, easily attracted by bright objects, and an inventor has utilized this fact to aid trappers. Bright objects, such as colored bits of cloth, often are placed near the traps, but these are useless at night. Then a double-faced adhesive tape with a luminous coating may be used, which glows so that it may be observed for some distance.

INTER-CAR TELEPHONE SYSTEM SAVES STEPS ON TRAIN

Long trips through a train to find if there is a seat in the diner or if the barber is busy, now are unnecessary for passengers on the Cascade limited between San Francisco and Portland. This train has installed an inter-car telephone system, each car being equipped with a telephone instrument with which passengers may communicate with any other car. The telephones may be used to order a meal, call a maid, summon train attendants or obtain any other service. A combination dial and push button, of the one-piece continental type, is used.

ELECTRIC SUNBATHS FOR FRUIT

Demands that the natural "bloom" be on fruit when it is purchased has resulted in the use of artificial sunbaths to restore the tints of the skins and give them the appearance of having been freshly gathered. The fruit first is wiped free of dust and moisture, polished by leathers arranged for rapid handling, then placed under the rays of the apparatus for from one to five minutes.

BAIT BUCKET WITH SPRING TOP HOLDS MINNOWS SECURELY

Minnows, frogs and other live bait are kept securely in a bucket that is equipped with coil springs which form the top. A perforated container fits inside the bait bucket, allowing water to circulate freely when it is carried, or the container may hang over the side of the boat in the water. When removing bait, the hand is inserted between the coil springs which snap back into position when the hand is removed.

A Photographer Risked His Life to Snap These Pictures of a Kansas Twister in Action

TORNADO IN ACTION PICTURED BY DARING PHOTOGRAPHER

Pictures of a Kansas twister in action were obtained by a daring photographer who risked his life to snap the tornado in various poses as it approached. The series of pictures the cameraman obtained included views of the tornado at a considerable distance, a nearer view with the black clouds throwing dark shadows on the ground and a close-up with the spout of the twister less than a mile away.

¶Twenty-nine states now levy a tax of four cents or more on gasoline.

PLANE GLIDES UP CANVAS RUNWAY ONTO STEAMER

Using a special runway covered with canvas or sail padding, a seaplane was successfully landed aboard a ship in recent tests. The runway was towed behind the North German Lloyd steamer "Luetzow," and the plane alighted on it and was pulled on board the vessel.

Towed behind a Ship, the Canvas Runway, Above, Was Used to Land a Seaplane; Below, the Plane Being Towed up the Runway

DYED GOOSE FEATHERS PUZZLE CUSTOM CHEMISTS

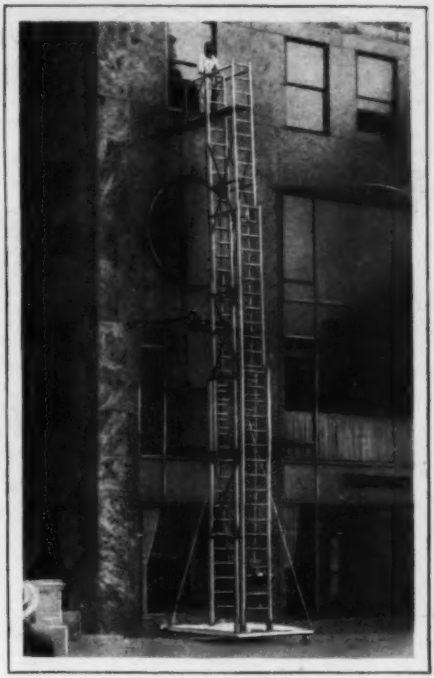
While tariff has always occupied a vital place in politics, the average person's knowledge of the vast organization required to carry it into effect ends with the custom inspector he meets upon his return from abroad. It does not include the hundreds of workers whose business it is to appraise the value of millions of dollars worth of goods brought into the United States yearly. That is the business of the chemists of the custom appraisers. Their subjects, the materials that come under the microscope or go through retorts and tubes, range from Chinese hair nets to toy Christmas trees and Scotch homespuns, sugar and manganese ore. For instance, a firm imported some toy Christmas trees from Germany and a sample was brought to the laboratory to have its value fixed. There was a little paper-bound pot and from it rose the tree with lovely green needles and tiny candles. The needles puzzled the chemists, and one was soaked in water. It swelled a little and ultimately opened and revealed itself as half a goose feather which had been dyed. Motion-picture films are brought to the laboratories and weighed, examined and appraised. Coal-tar products, liquor and various synthetic fluids are distilled and their parts made known. Another example of the work of the custom chemists was shown at the time of the Philadelphia exposition. Some of the exhibitors brought in fabrics, scarfs and small carpets, which were said to be so old that exemption was claimed on the grounds that they were antiques. The tariff law lists as antiques articles over 100 years old which have an artistic value. The fabrics in question were examined. They certainly looked old enough, but the tests showed they contained coal-tar dyes and as those dyes were not discovered until 1857, they could not have been as old as it was claimed. The exhibitors protested, but the goods were taxed. The work of the custom chemists is constantly full of surprises.

For example, one day some hair nets were brought to the laboratory. Human hair carries a duty of forty-five per cent while all other kinds are taxable at ninety per cent. In hair nets, yak hair is sometimes used. The chemists knew that but they were unfamiliar with yak hair and this hair might be merely coarse human. So they sent to the zoo for yak hair and the microscope told them the rest.

ANGLERS SEE BENEATH WAVES WITH A WATER SCOPE

Peering into twenty-five or fifty feet of water to discern objects clearly is made possible with an instrument known as a water scope which fishermen are using to advantage. The scope is two feet long with a nine-inch lens cemented in place to make it water-tight. The lens is submerged in the water and the operator peers through a visor, obtaining vision thirteen feet in diameter in twenty-five feet of water. Besides being used by anglers, the instrument also is employed in locating articles lost in water, and has even been used to find the body of a drowning person and thus save his life. In the average fresh-water lake, distinct vision is possible at twenty-five feet.

Angler Peering beneath the Surface with a Water Scope Which Penetrates Twenty-Five Feet



Extension Platform, Like an Extension Ladder, Used to Wash the Surfaces of Tall Buildings

WASHING FACES OF BUILDINGS IS MADE EASY

Even buildings must have a bath at intervals, and a lofty extension platform, which extends to the fourth story, has been made to allow workmen to clean the polished stones of a tall Chicago structure. Parallel extension ladders form the legs of the elongated platform resting on a base to which rollers are attached, so it may be wheeled easily along the wall.

KEEPING FOODS DRY

Foods that are likely to absorb moisture, such as dry cereals and crackers, may be kept in a palatable condition in a cabinet constructed to prevent moisture. The container holds an odorless material that has a great affinity for moisture and absorbs dampness from the air or food. Besides being used to keep foods crisp and fresh, the cabinet also may be utilized to store metals that rust or any articles harmed by moisture.

On the Trail of

By PAUL D. PADDOCK

POISONS and mysterious deaths have been linked in the public mind since the dawn of history but modern chemical science has done much to rob such cases of their baffling aspects. Along with the scientific detective, the chemist is winning increased recognition in the war against crime. Police departments are installing laboratories where such apparently trivial things as spots on clothing, weapons or money frequently provide the final evidence that may free or convict the accused.

"Mysteries? Yes, there are plenty of them in the chemical realm of police investigations," says Dr. W. D. McNally, former coroner's chemist of Cook county, Illinois, and one of the best known experts on poisons in the country. "But the problem of finding the poison and identifying it is a relatively simple process in chemistry. Witnesses may disagree but test tubes, in the hands of efficient men, generally tell the same story. That's just one reason why the chemical evidence in a case is regarded as so important.

"Not long ago, a suspect in a murder case was about to be freed when a tiny spot was discovered on one of his shoestrings. Analysis showed that the spot was human blood. He had carefully washed all his clothing but had forgotten the shoestrings! A similar oversight led to the conviction of another man who had forgotten to wash his shoes. Incriminating blood stains were found on the leather.

"Chemists have positive means of identifying human blood from that of animals, although it is not possible to identify the blood of a specific person. In the same way, human hairs can be distinguished from those of animals, but cannot always be identified as coming from a particular person.

"Recognizing that soils have different chemical and physical properties, detectives sought for incriminating evidence in a recent murder by closely examining an

Portable Chemical Laboratory Los Angeles Police Use in Solving Crimes, and Guard with Machine Gun

Poison Mysteries

Coroner Herman N. Bundesen Questioning a Witness during a Gang-Slaying Inquest; the Gun Was Linked to the Murders through Marks on the Bullets in the Victims' Bodies

automobile for traces of swamp mud like that in which the victim was found.

"Chemical science has developed interesting facts concerning weapons. For instance, analysis of the contents of a gun barrel will tell whether the weapon has been fired recently, although it is not possible to determine this factor exactly in terms of hours. There is an interesting field of research here, and possibly chemists will be able to fix the time accurately on the basis of chemical investigation of the powder marks.

"Important court cases have been decided on the basis of the kind of powder found in shells, weapons or upon the body of the victim. It is well known that suicide or murder is often established by the presence or absence of powder marks upon the body. A trained investigator can tell almost to the inch how far a weapon was held from the person killed, by careful inspection of these marks.

"In a court case, a suspect was alleged to have been in a pool room at the time a crime was committed. He denied being there, but dust found in his pockets, on chemical analysis, proved to be chalk such as is used on billiard cues. Like many other players, he was in the habit of putting his hands in his coat pocket after using the chalk and the dust proved a clue against him. Chemical and microscopic examination of the dust found on clothing, on automobile tires or other objects frequently reveals important evidence. The physical size of an article is not of great moment to the chemist to whom tiny spots and flecks of dust are sometimes monumental in their significance.

"In the field of poisons, the chemist has developed tests that reliably identify the 100 or more kinds commonly used. Poison is a hazardous tool for the slayer. Today, with proper investigation, it is practically impossible to 'cover up' a death by poison. It leaves an unmistakable trail that frequently can be followed as plainly as though it were written in stone,

Coroner's Chemist Ralph W. Webster Examining Blood Stains on Handles of a Wheelbarrow That Figured in a Murder Case

although the unfortunate victim may have been buried for months."

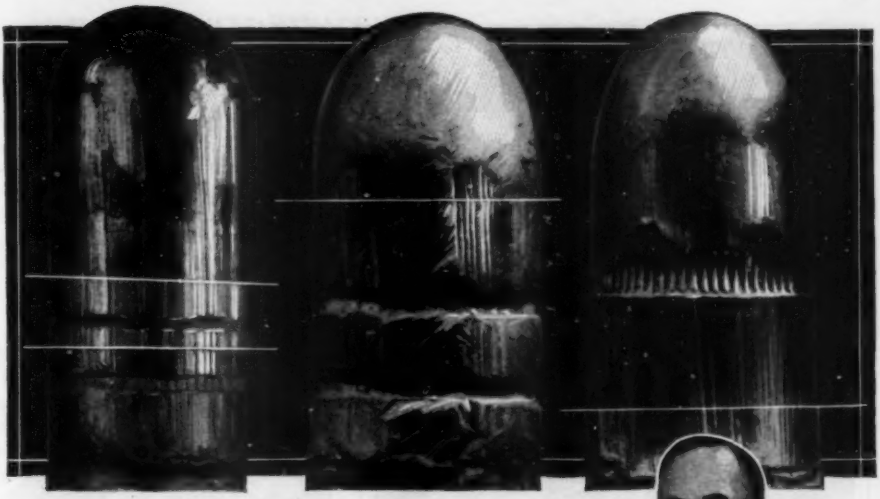
During his seventeen years' experience as coroner's chemist, Doctor McNally investigated and helped solve some 15,000 poison and other cases in which chemistry produced deciding evidence. He planned the present Cook county chemical laboratory, one of the most completely equipped in the country. Here, almost daily, important evidence relating to deaths under mysterious circumstances, is discovered by chemical methods. In one corner of a room where special tests are made, is a tragic collection of objects, each one of which might tell a dramatic story. A stained dagger, an old wheelbarrow, a flatiron, clothing with spots, all awaiting the searching eye of science.

"I was a university student when I first became interested in poisons," Doctor McNally said. "There had been a suicide. The late Prof. Albert Prescott was called and, after a brief examination, he named the drug that had been used. Its characteristic odor had made identification relatively simple, he explained. I decided that I would like to be able to clear up such cases in as efficient a manner, so I began to study. I have encountered many poison cases since that time. In one, a woman had used a drug to kill several husbands. She and her cousin had disposed of thirteen men in this manner. Their victims were supposed to have died from natural causes. But I happened to be called to attend one of them. I detected a peculiar odor on the dying man's breath. The Prescott instance came back to me and the crime was revealed.

"A chemist-detective, however, must never jump at the conclusion that the drug he finds has caused the death, and he must apply wide knowledge to the facts in each particular case. It's one thing to find poison in a body; it's an entirely different thing to prove that the poison caused the death or that it was administered by a certain person for a specific motive. Take the case of a supposed murder. Now, murder is committed for three chief reasons: first, love; second, financial gain; third, hatred. The chemical evidence discovered must be alined with all the other facts in the case and with such motives as were supposed to have prompted the crime. Frequently it happens that the chemist's findings are of supreme importance.

"Such was the fact in a recent case in which an unfortunate error on the part of a chemist almost led to the conviction of a young man for murder. The trial was one of the most sensational in recent years and developed, among other mystifying factors, the presence of three spots on the coat of the young victim. These proved a riddle until it was shown, with little likelihood of error, that they had been placed on the coat after the death.

"The testimony was that the young man had access to large quantities of a chemical substance said to be the same as that which caused the young woman's



Telltale Marks on Bullets from a Suspect's Revolver, and Capt. William A. Jones at "Bullet-Fingerprinting" Microscope

death. The stuff had been thrown on a greenhouse refuse heap. Naturally, this point was incriminating, and had it not been destroyed by later evidence, there is little question but that the defendant, who finally was acquitted, would have been convicted. But a chemist had made a mistake in his analysis. The substance on the refuse heap, although like that which had caused the death, was not exactly the same, hence could not have been used in the crime.

"The three spots were especially interesting. Witnesses testified that no such marks had been seen on the young woman's coat when her body was found. But they were clear enough weeks later, about fifteen inches from the coat collar and four inches from the buttonhole. The fact that they were in an absolutely straight line was important. Only a miracle could have arranged them in that order had they been caused by drops falling from a bottle of liquid poison. Obviously, the spots were meant to indicate that the young woman had taken the poison voluntarily, a supposition that was strengthened by the fact that when she was found, her right hand was bare and her left hand gloved.

"The spots gave off the odor of the fatal drug. But my tests plainly showed that the substance would not retain its odor over so long a period as had elapsed since the young woman died. In the examination of hundreds of blood stains and other spots found on clothing, I had never observed a parallel case in which spots were found in a straight line. Other tests showed that the chemical, when dropped upon coarse woolen material, like that of the coat, rolled off like so much mercury. How the spots got there, when they were made and by whom are still unsolved mysteries.

"We live in a world of chemistry and are surrounded by poisons in our daily

X-Ray Films That Will Not Burn, to Prevent Poison Fumes in Case a Hospital Fire Threatens the Storage Vaults

toil, but that need give no cause for alarm. Science has found reliable antidotes for various harmful substances and has developed safeguards where danger lies. Most of the superstitions about various drugs and foods have been abandoned. We know that tomatoes are not poisonous, for instance, although not many years ago they were considered inedible. Until recently, there has been a lot of useless worry about poison in foods. Some persons still believe that fatal poisons will rapidly develop if food is left in tin cans. Well, it is not a good practice to leave foods so exposed and juices in time will react upon the solder in the can if that material is there and is in contact with the food, but most containers are much safer than is popularly supposed. Illness is frequently caused by eating spoiled or partly decayed food, but it is a mistake to think that every such case is one of 'ptomaine poisoning.'

"One of the commonest poison hazards is that of carbon monoxide. This gas is formed as a by-product of combustion. Ammonia, washing compounds and other household chemicals produce serious consequences and sometimes death, particularly among young children who carelessly are allowed access to them and swallow them. Great care should be taken in fumigating. Reputable firms that do this work are licensed and know their business.

"The scientific examination of evidence in case of a crime and the application of more certain methods to guard our daily health and welfare are but indications of the added service man is gaining from his knowledge. Only recently, the bureau of standards has recognized the importance of more scientific criminal research and has taken up the problems of identification of documents, typewriters, guns, bullets and other things with a view to establishing more accurate standards for this type of work. The 'Sherlock Holmes' of tomorrow will be far more scientific than the story books now picture him. He will be a combination of the detective and the true scientist, and will have at his command increasingly reliable instruments to help him in the warfare against crime."

AUTOMATIC ELECTRIC KETTLE WILL NOT BOIL DRY

Like toasters, coffee pots and waffle irons, the tea kettle now is moving to the dining room. An electric kettle may be used with safety on the dining table because it is self-regulating, cutting off the current before it boils dry, automatically reducing the heat before boiling over, and maintaining any predetermined temperature.

MODEL PLANE HAS PARACHUTE AND CLOTHESPIN JUMPERS

Clothespins serve as the heroes of leaps from a model airplane equipped with parachutes, in an ingenious toy made by a Los Angeles school boy. The twenty-seven-inch parachutes with their dare-devil wooden-headed passengers are packed on each side of the fuselage underneath the wings. They are held in place by a triangular flap, one point of which is fastened by a pin thrust through eyelets. When the plane reaches an altitude of 100 feet, the pins are pulled out automatically and the parachutes, with their clothespins dangling safely at the end, come floating to earth.

Model Plane Equipped with Parachutes for Clothespin Passengers; at Right, a Parachute Descent

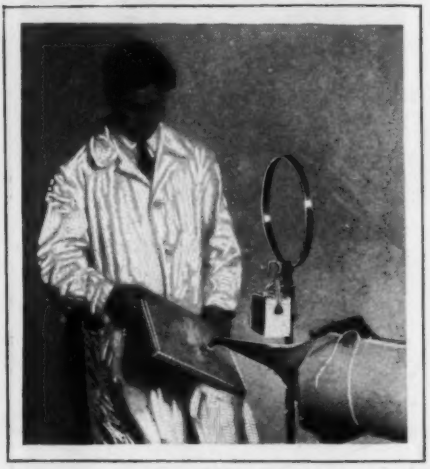
SWEETS HELP WORKING GIRLS RESIST FATIGUE

Feeding candy or other highly concentrated, energizing food to working girls speeds up their production, particularly during the late afternoon slump, Dr. Thaddeus L. Bolton, head of the department of psychology of Temple university, has decided after a series of tests on twenty stenographers. Fatigue, diet and working capacity were found to be closely related. One group of girls each afternoon received candy, cake and sweetened orangeade, two other groups received sweets on part of the days and the fourth group went through the afternoon without any refreshments. Working capacity was comparatively low at the beginning of the day, increased after a "warming up" until about 2:30 p. m., then fell except that there was a spurt at the end. The groups taking the nourishment, even only part of the days, showed a higher working rate than the no-food group.

TIDE EMPLOYED TO SAVE PILING FROM MARINE BORERS

Marine borers, the foes of wood, metal and concrete piling, are being fought by harnessing the tide to combat them on the west coast. Heretofore it had been customary to inject preservatives in the piling material to prolong life. The latest appliance consists of blocks of wood tied to a metallic ring about a pile. The free-floating blocks shift up and down the piling and by their friction knock off incrustations, preventing new growths from taking hold. The average life of untreated wooden piling in this region ranges from eight months to two years and those equipped with the blocks last many times that long, marine engineers say.

RADIO AIDS MUSIC STUDENTS TO HEAR OWN VOICES



Testing the Acoustic Properties of the Wall Board with the Help of Radio

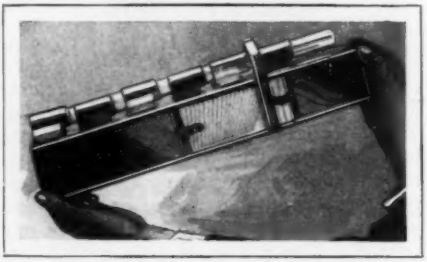
Acoustic properties of wall linings are tested by radio at the Berlin Academy of Music. A tube containing a miniature loud speaker producing a standard-tone effect terminates at one end in a funnel from which the sound strikes the material to be tested. The reflected sound waves are picked up by a microphone communicating with a loud speaker in another room where comparative tests are made with the original tone. Another device, the steel-wire voice recorder, enables a student to study his own voice. It is based on the variable magnetization of a steel wire passing in front of the poles of an electromagnet activated by microphone current. By reversing this process, causing the magnetized wire to pass in front of a similar electromagnet, currents corresponding to the original microphone currents are induced, resulting in a remarkably faithful reproduction of the singer's voice in a loud speaker.

HARDENED ALUMINUM WILL NOT STAIN OR TARNISH

Durability of aluminum is increased by a treating process recently developed which not only hardens the metal but also eliminates the tendency of the surface to smudge, tarnish or scratch, and enables it to resist the effects of salt water and various acids and corrosive agencies. The process provides a protective finish which will take many delicate color effects. The advantages of the treated metal extend into every field where aluminum products are used. The treatment in effect is comparable to the cyanide process of hardening steel. Every item treated is completely submerged and the inherent advantages of ductility and flexibility in forming are preserved. Laboratory tests showed an increase in hardness of more than 100 per cent. Cooking utensils so treated are left free from tarnish and preserve a bright polish. Airplane manufacturers and the automobile industry see possibilities in the treated metal for uses where it could not be employed previously because it lacked hardness.

SAND TESTER SHOWS QUALITY OF CONCRETE MIXTURE

Determining the quality of sand being used in concrete work without sending samples to a laboratory is possible with a sand tester that is simple in operation. The tester grades the sand and gives an indication of its cleanness. It consists of a water-tight frame into which are fitted a graded series of fine-mesh screens and a series of glass vials connecting with each of the screen sections. A small metal measure of sand is poured into an opening in one end of the casing, to which water is added, the mixture being gently shaken to cause separation. The instrument is turned vial side down, the various screenings falling into the several vials, giving the percentage of each grade of sand either passing or retained.



Sand Passes Successively Through a Graded Series of Screens in This Simple Sand Tester

A Thunderbolt Factory

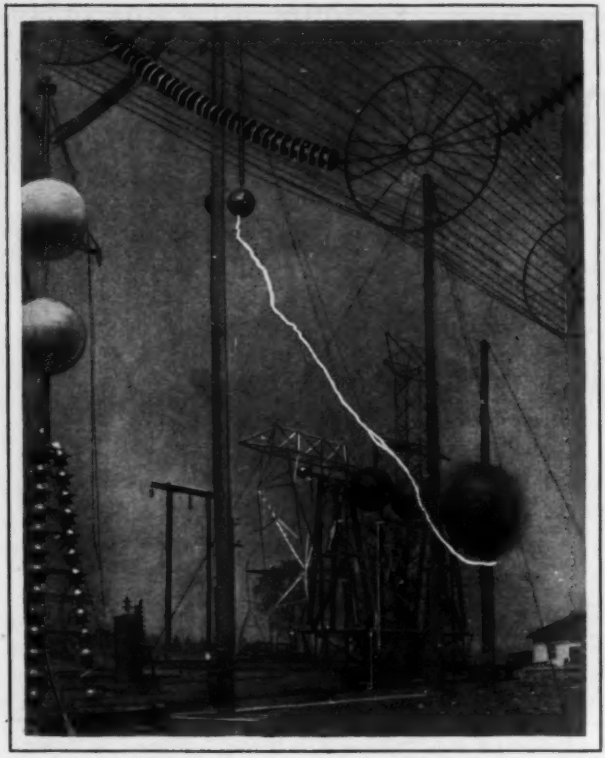
Sphere Gap Used for Controlling and Measuring Artificial Lightning at the Outdoor Laboratory; the Upright Supports Are Special Insulators and the Dial Records Distance between the Spheres

IN THE MIDST of a strange forest of poles and towers of various shapes, a seven-foot balloon, filled with hydrogen gas, sways at the end of an anchor rope. About thirty feet above the sphere is a huge cage aerial, of the type used in radio and supported by long strings of heavy insulators. A small metal ball hangs down a short distance below the cage, just above the balloon. At respectable distances, several men are standing, evidently waiting for something to happen.

One gives a signal, and another presses a button that projects from the side of a small box. At once the spectator experiences a strange sensation. He knows that something is taking place about him, yet he cannot tell what. He feels that a strange tension is in the air. Then a rustling sound greets his ears, coming from the general direction of the cage-aerial arrangement.

Something is happening around the small sphere hanging from the cage. Streamers almost invisible, like heat waves above a railroad track on a summer day, are darting down from it. Then suddenly a blue-white flame of great brilliancy darts from the sphere to the balloon, zips over the surface to the anchor rope, and is gone. There is a report like the firing of a three-inch gun. The balloon seems to shudder as the man-made lightning strikes it, and then continues to wave in the breeze.

Such a demonstration which, to the visitor, seems like an event that takes place in the setting for a highly imaginative scientific novel, is an almost daily occurrence at the huge outdoor high-voltage laboratory of the Ohio Insulator company at Barberton. The hydrogen-filled balloon was being subjected to artificial lightning flashes of more than 3,000,000 volts in an attempt to develop a method of protecting racing balloons from natural



Testing a Hydrogen-Filled Balloon with a 3,000,000-Volt Spark; the Flash Suggests the High Voltage in Lightning

lightning. Incidentally, following the experiments described, a satisfactory protective device, consisting of a wire screen about the gas bag and balloon basket, was designed.

But the developing of a balloon protector was but one of the many things that are done at this unusual "lightning factory." Arthur O. Austin, chief engineer, is the modern Thor who can manufacture thunderbolts at will. With his associates, he built the high-tension laboratory on what was formerly a model farm. At various places in the maze of apparatus that fills the field in front of a chateau-barn, are pairs of huge copper spheres, four in all. By increasing or decreasing the distance between the spheres of a gap, the operators can control and measure the voltage of the arc during a test. Each of the spheres is of heavy copper, and weighs nearly one-half ton.

The laboratory field is covered by a network of railroad tracks upon which a strange game of chess is frequently played. The chessmen are steel and wood transmission towers of all types, oscillators, sphere gaps, and the like. The process of weeding out a particular tower from the forest of several dozen, and placing it in position for a test is as intricate a task as winning a closely contested chess or checker match. Each of the towers, as well as other portable apparatus, is mounted upon a small car to permit easy moving.

Engineers using the laboratory often have the job of "shooting trouble" for a power company in some remote corner of the world in an effort to learn why an apparently perfect transmission line failed to do its job of carrying power to some center of population. Instead of going to the scene of the trouble, they can bring the problem to their laboratory and reproduce the conditions which caused the failure.

The lightning manufactured at the experimental station can produce many of the results of that made in nature's laboratory. If a man should get in the way of a 3,000,000-volt spark, he would immediately become a task for an undertaker. But it is surprising that a wide-open wire screen can provide complete protection from twenty-seven-foot lightning flashes. At the indoor laboratory, the spectators' balcony is equipped with such shielding. It is a strange experience to stand behind this screen and watch streamers of fire leap out and strike a foot from your nose.

It is by playing with lightning that scientists hope to develop methods of transmitting electrical power at practically no loss, so that you can make toast,

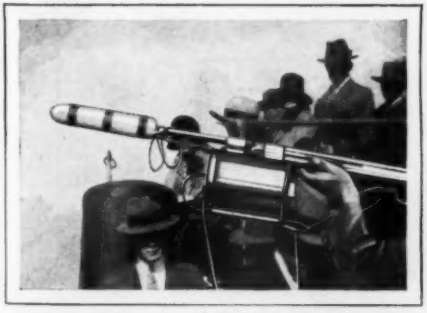
heat your home in winter and cool it in summer, and do a hundred other jobs electrically, at a fraction of the cost today. Who knows but that an accidental discovery will be made in such a laboratory which will give the world practical radio power transmission, or some other equally revolutionary development?

THE PAY OF AIR PILOTS

Pay of the pilot on a regularly scheduled American air-transport line is estimated at $5,556 a year by the aeronautics branch of the department of commerce, which adds that he averages less than two and one-half hours a day in the air. As he flies slightly more than 40,000 miles a year, his daily mean is about 110 miles. The records were compiled from reports on 275 pilots employed by twenty-five air-transport organizations. During the latter half of 1928 the operating revenue of the air companies was slightly under $5,500,000, of which about four-fifths was from air-mail contracts.

LIFE-SAVING RIFLE AND ROCKET SHOOT LINE TO SWIMMERS

Capable of throwing a float attached to a lifeline 250 yards, an ordinary rifle fitted with a rocket attachment recently was demonstrated in South Africa. The rifle has a container for a roll of cord and is capable of throwing the float 150 yards, but as it is falling a rocket explodes and carries it 100 yards farther. Six swimmers were hauled ashore at one time during tests with the thin line.



Life-Saving Rifle, Fitted with Rocket Which Throws Line and Float for 250 Yards

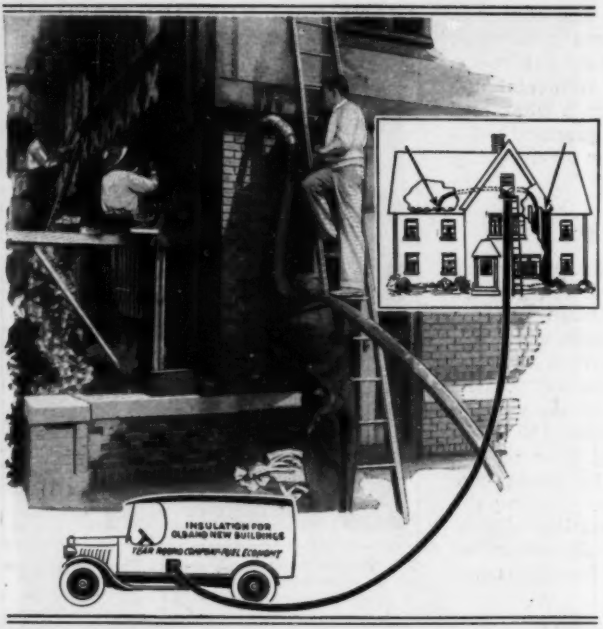
BANK USES VENDING MACHINE TO ATTRACT SAVERS

This Vending Machine Encourages Thrift by Dispensing Small Savings Banks for Coins

Automatic devices for vending "book banks" have been placed in operation outside the doors of a New York bank. A quarter dropped into the machine brings forth a metal container shaped like a bank book, one end of which is slotted to receive coins up to a quarter. When the container is filled, the owner brings it to the bank, where his quarter is refunded, the contents of the savings box removed and deposited in a savings account and the container returned to the owner. Boys and girls have been the best customers.

PHEASANTS KILL CROP PESTS

In response to a complaint by Nebraska farmers that pheasants were destroying planted cornfields, a game warden killed thirty-six of them for tests. Corn was found in only one crop, but in another were found sixty-one cutworms, a third had eight June bugs, still another contained forty-two black beetles, and in all the others were found bugs, worms and seed pods from poison ivy and weeds. Some of the corn taken from one crop appeared to be poisoned corn that had been spread about to kill ground squirrels. The poison does not affect the pheasants.



Photograph of a Typical Filling and Insulating Job and, Drawing to Show How Material Is Pumped between the Walls of a House

INVISIBLE WALLS SHIELD HOME FROM HEAT AND COLD

Effective insulation for residences and other buildings is furnished by a wool-like substance prepared from stone and blown over ceilings and into hollow wall spaces by special pneumatic apparatus. The result is that the interior is protected by a blanket of the wool, four inches thick or more, virtually a house within the outer walls, to keep out the cold, prevent heat losses and to help keep the home comfortably cool in summer. The insulation also acts as a sound deadener. It is fireproof, does not settle, is dust free and will not harbor vermin. Old homes, as well as new ones, of frame construction, brick veneer or stucco, may be treated. The material is blown through a hose from a trailer truck, and the work is done from the attic or the outside of the house.

COLLEGE TRAVELS ON WHEELS

In order to study geology, geography, history and other subjects at first hand, a motor college is traveling from Massachusetts to California and back. The students, carried in motor coaches from place to place, make stops to study soil, mines, forests, fauna and flora, deserts and mountains besides visiting historical points and making trips through the Grand Canyon, Yosemite and Yellowstone.

PUNCHING BAG FOR AUTOISTS

Striking with a stick at a captive balloon while driving an automobile fifty miles an hour is a stunt that is proving popular among Berlin motorists. It was started simply as a form of practice for auto polo, but was found to be a good way to prevent auto accidents on the roads, as it forced drivers to develop steady nerves.

This Girl Driver Is Developing Steady Nerves by Striking at Captive Balloons with a Stick While Speeding

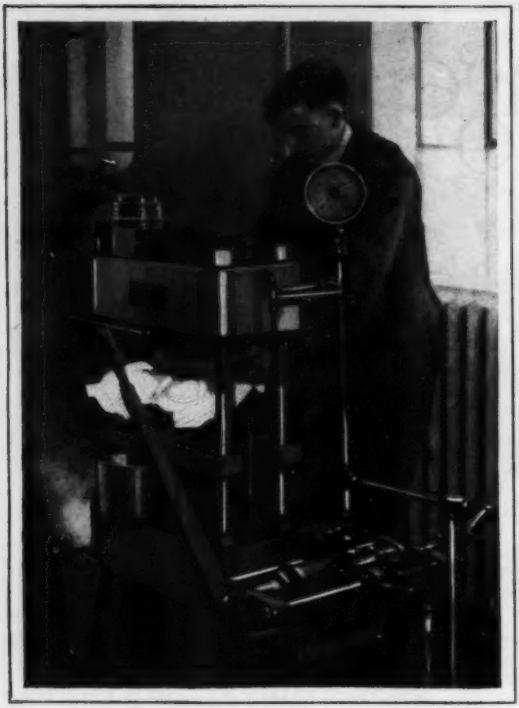
Salvage from the Sea

Scaling Fish at a Large Commercial Plant; the Scales Are Used in the Manufacture of Pearl Essence and Other Lustrous Materials

A FIFTEEN-million-dollar business in the utilization of waste and the development of by-products of the fisheries industry has been established in the United States during the last three years, and new sources of revenue are being sought, from methods of utilizing fish scrap as feed for dairy and barnyard animals to the deodorizing of fish oil for use in soaps, cosmetics and cooking substances.

Hunting sharks for their fins and hide for use in the manufacture of a large variety of articles ranging from women's handbags to sword hilts and nose grips for eyeglasses is a growing and thriving industry. The skins of many aquatic animals, including those of sturgeon, garfish, wolf fish, cod, cusk, watersnakes and frogs, are being used for leather or novelty purposes. Eel skins are tanned for bookbinding, in making whips, suspenders and other articles, or dried and oiled for use as a substitute for window glass. Bags made of alligator hides are in much demand. Hides of seal, sea lion and walrus are also tanned into leather of especial value to silversmiths, gun manufacturers, and the like, for removing mars and scratches and for polishing fine metal surfaces. Fish skins, such as cod and haddock, are used in the manufacture of fish glue, and fish sounds or air bladders are extensively used in the manufacture of isinglass, for clarifying beverages, in adhesives and in sizings to impart a luster and stiffness to linens and silks.

The "Christiania," modern floating oil factory, was cruising lazily over the whaling grounds. A bull sperm appeared suddenly to starboard and the gun crew sprang into action. A bomb-laden harpoon shot out over the water and sank with deadly explosion into the whale directly back of its head. Late that afternoon not a trace of whale in its original form was to be found anywhere on the ship. The fat had been made into oil, the whalebone was stored in the hold, and



Bureau of Fisheries Experimental Plant for Extraction of Fish Oil Used in Making Soaps and Cosmetics

the scrap made into meal. Thus has modern science improved upon former wasteful methods of capturing whales and of transporting the fat to land stations. The floating factories are provided with equipment at bow, stern or sides for hauling the huge mammals aboard for cutting up and reduction. But by very reason of the efficiency with which these mammals are being hunted in order to furnish milady with scented soaps, coldcreams, and other cosmetics, the whaling industry is threatened with extinction, and extensive research is now being made in developing other fish oils.

Milady will not be pleased, perhaps, to learn that her vanishing cream, beauty cream, toothpaste and perfumed soap may have been made in part from a fish; but these articles may contain glycerin, and glycerin is a by-product of the soap industry and derived from fats and oils such as fish and whale oil. The more than 10,000,000 gallons of these oils produced annually is valued at $5,000,000.

The total annual catch of hard crabs in the United States and Alaska is approximately 39,000,000 pounds. Inasmuch as approximately eighty-five per cent of the crab is non-edible, the annual waste is around 33,000,000 pounds. Nearly 20,000,000 pounds of this green waste should produce, upon reduction, about 8,000,000 pounds of dried crab scrap suitable for poultry feeding.

In a recent experiment, the bureau of fisheries used crab scrap to supplement the poultry diet. A flock of birds was divided into two pens of twenty-five each. From December to March the birds that received crab scrap laid 938 eggs as compared with 479 eggs laid by the birds which were fed a standard ration.

The huge beds of oyster shells of ancient civilizations are now proving a bonanza in the manufacture of poultry grit and lime, and no oyster packer any longer has difficulty disposing of this former waste. The demand for oyster shells is larger than the fishery can supply and exploration parties are continually searching for beds of other ages. The annual production of poultry grit and lime from oyster shells is now approximately 300,000 tons, and is valued at $2,600,000.

During the war, the European supply of pearl essence or fish-scale essence was cut off and research had to be conducted looking toward the development of new sources of supply in this country. The scales of the sea herring of New England were found to contain the necessary element, and, at the present time 2,000,000 pounds of fish scales are used annually in the manufacture of imitation pearls and imitation mother-of-pearl celluloid products for use on the backs of hairbrushes, hand mirrors and other toilet articles, umbrella handles, buttons, and other commodities. The domestic production of pearl essence has become so large as to attract foreign buyers and the manufactured products are to be found in every five and ten-cent store in the land.

Discussing the marked growth of the fisheries by-products industry in recent years, and the possibilities for further expansion, Deputy Commissioner Radcliffe, of the bureau of fisheries, declared that "the number of fishery products catering to our needs and vanity today are greater than at any time in the history of the world. Figuratively speaking, the modern woman might dive into the sea and emerge completely clothed and adorned.

"She will be wearing a dress of artificial silk made from the shells of crabs, lobsters, or other crustaceans; a fur coat of otter, sealskin or beaver, with mink or muskrat trimmings; shoes of shark skin and mussel-shell buckles adorn her feet; and the buttons on her dress are of pearl derived from fresh-water mussels.

"Coral earrings and a tortoise-shell comb complete her outfit. In her alligator-leather handbag, she carries a cake of soap made from fish oil; coldcream from whale oil; a sponge; a bottle of perfume with ambergris as the fixative, a hand lotion made from seamoss, and gloves of cod skin. On her way home, she views a photogravure which was covered with fish glue before etching, and purchases a beaver hat adorned with an aigrette made from whalebone; a toilet set trimmed with artificial pearl made from fish-scale essence; an amber pipe for her husband; a bottle of cod-liver oil, agar-agar for gelatin, and cuttlefish bone for the canary."

BATTERY INDICATOR FOR AUTO CHECKS POWER AND WATER

Affording a constant check on the power and amount of water, a battery indicator may be attached to the dash or steering column of the automobile. The degree of power is shown when the starter is depressed, while the amount of water is indicated at all times, both being shown by the same needle.

ARMCHAIR AND BED IN ONE SAVE ROOM SPACE

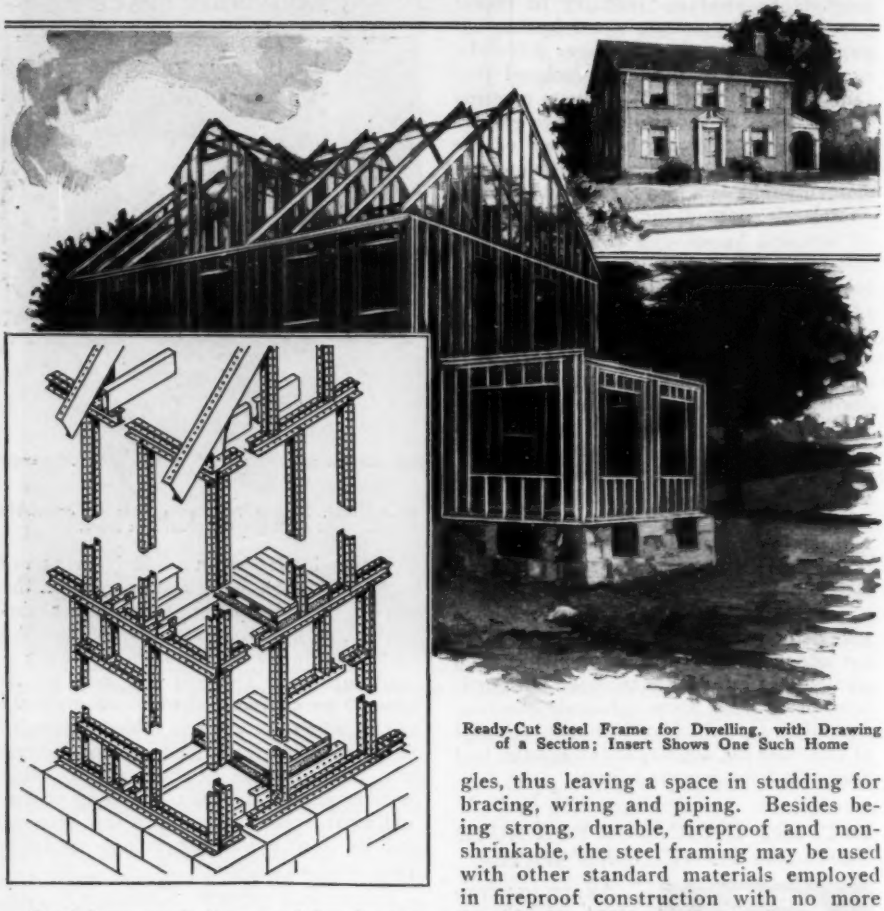
An Armchair That Is Transformed into a Comfortable Bed at Night by Turning a Lever

Simply by raising a small lever at the back, a comfortable armchair, now on the market, is quickly converted into a single bed. The two arms descend and the back section swings around to make a head support. The bed pad may be attached permanently and is completely hidden when the chair is folded up again. The conversion into a bed is accomplished by a single motion as there are no extra parts to insert or adjust. Folding or unfolding the chair takes but a few seconds and its double purpose is not apparent when used as a chair.

MEADOW MICE DESTROY CROPS

One meadow mouse eats more than an ounce of green food a day or twenty-three pounds a year, government experiments to determine the destructiveness of these rodents have shown. One hundred mice to an acre, which is not a large number, in a year destroy more than a ton of green grass and even as few as ten to the acre on one hundred acres of meadow consume eleven tons of grass. This number, on the 65,000,000 acres of hay raised, represents a loss of more than 3,000,000 tons a year, or about $30,000,000 in hay alone.

STEEL HOUSE FRAME GIVES SKYSCRAPER STRENGTH



Ready-Cut Steel Frame for Dwelling, with Drawing of a Section; Insert Shows One Such Home

Steel framework, long used for the skyscraper and office building, is now utilized for the modern dwelling along the same lines as wood framing. The steel is delivered ready for assembly without cutting or fitting. Ease in assembling is afforded by perforations of all pieces except floor joists each two inches, the system being so flexible that a house may be planned without the restriction in arrangement and style which heretofore has prevented the economic use of steel for small homes. The metal is used for sills, girts, plates, studs, joists and rafters, with light angles for studs and corner posts, and separation plates to join angles, thus leaving a space in studding for bracing, wiring and piping. Besides being strong, durable, fireproof and nonshrinkable, the steel framing may be used with other standard materials employed in fireproof construction with no more trouble than when such materials are employed with solid masonry walls or wood framing. Standard clips and plates for connecting various parts make the assembly of such a structure resemble the piecing together of a child's erector set. The framing also is being used successfully in the construction of garages, small apartments, school houses and farm buildings, and for partition work in hotels, apartments and office buildings. While the first cost of steel framing is higher than wood, this, the makers say, is offset by the saving in labor. Little skill, aside from the ordinary supervision over construction work, is required in assembling

the framing, and mechanics wholly unfamiliar with the system have been able to complete the frame quickly after a demonstration of the method, because it is so similar to the assembly of the ready-cut wood framing.

AUTO SIDE SWAY REMEDIED BY CONTROL

Consisting of only two parts, a cylinder and piston, a shock absorber has been made to control starting jerks, sudden stops and side sway as well as the ups and downs of automobiling. The six-way shock control, aside from simplification of the hydraulic principle, also involves angular, instead of vertical, installation, the rear absorbers being inclined forward, and the front axle units inward, connections in each instance being with the chassis and the axle, giving direct action. Angular instead of vertical installation results in controlling side sway and starting and braking jerks, while the direct-action installation gives a quicker response. The absorbers also check the tendency of the car to skid or overturn, stopping the twisting torque caused by uneven braking, and extending to keep the wheels fixed to the ground around turns. It has only one moving part cushioned in a fluid impervious to temperature changes, contains no complicated parts, levers, wheels or springs and is intended to last as long as the car without attention. "Shimmying" is eliminated and "bottoming" the springs is prevented.

This Roof-Top Studio for Pupils of a Chicago Art School Provides Both Natural Lighting and a Skyline for a Model

ART STUDENTS HAVE CLASSES ON SKYSCRAPER ROOF

Chicago's skyline forms an excellent model for pupils of an art school who hold classes on the roof of a tall building. The location, it was found, provided both the natural lighting and the natural scenery for the students' work.

FINDS SYMBOL FOR WORD "THE"

After spending thirty years checking up on Hebrew, Anglo-Saxon and other languages, a scholar has formulated a symbol for the word "the," which is used more often than any other—once in every fifteen words on an average. The symbol he hopes to have adopted generally looks like a merger of the letters "p" and "b" in lower case, while the capital resembles the capital "E" married to the second half of the parenthesis sign. The symbol is an adaptation of the Anglo-Saxon character designating the "th" sound.

Wings for the

By EDMUND GILLIGAN

THE SEAPLANE, the radio and the homing pigeon are bringing a new era to Gloucester fishermen.

For generations the city of Gloucester, Mass., lying in the wide embrace of Cape Ann, has been the home of the harvesters of the sea. These fishermen have always been willing to gamble with the elements. They have matched their seamanship against the tricks of the northeaster. They have been ready to chance life and ships and strength for their one prize: a holdful of mackerel.

But even bravery and stout seamanship could not win the prize if the mackerel could not be found. Days and nights of searching off Stellwagen banks and in the other shoal waters often ended in disappointment. Money for outfitting and for wages was wasted. Often the great fleets came slowly home without a single fish aboard.

Now all that is changed through the radio and the airplane. The coast-guard pilot, soaring high in the clear morning sky from Gloucester harbor, roars far above the Atlantic area that stretches between the curling tip of Cape Cod and the brown rocks of Thatcher's island. Straight into the rays of the dawn, the big ship climbs until the proper altitude is reached and it stands out to sea. To the east and to the south, where the keen eyes of the bareheaded pilot gaze steadfastly, the ocean lies calm and blue, save where the crests of the waves break in tiny silver falls and splashing fountains.

The sea and the land, visible from the cockpit for miles, reveal the world awakening. Swift minutes pass as the pilot drives onward into the sun. Suddenly, upon the rim of the ocean, where the sea breaks somewhat whiter on Cashes ledge, he spies a group of schooners. Four in number, they ride together on the waves—painted ships upon a painted ocean. A

Fishing Fleet

Glimpse of Radio Compartment in Plane, and Receiving Reports at Gloucester Coast-Guard Station

minute later, as the plane roars steadily toward the fleet, another group of schooners, idle also, come into view. Five hulls this time, black-timbered, businesslike, waiting for action. The seines are ready under the beam.

Now the plane drops slowly down. The pilot shuts off the motor and the organ-like strumming ceases. There is silence, save for the whine of wind in the struts and against the broad wings. Springing to their feet, the fishermen wave their hats as the airman swoops nearer. He salutes them. But his face is serious. He scans the empty decks. No sign of rich sea harvest there. He sees the wheeling gulls, hungry voyagers that follow the fishermen, flying aimlessly around, crying plaintively. The birds have not had breakfast yet. Nor have the men gone to work.

Three days now the ships have beaten up and down the coast from Cashes ledge to Platts bank and thence to Stellwagen bank, patiently on the lookout, hoping for the sign of the great schools of fish. Empty holds wait for the welcome cry of discovery. The men listen to the radio program from the station at Gloucester, which

sends out the reports of fish prices, tells of the fish splitters waiting for work at the wharves, and gives the small receipts at Boston that mean higher prices.

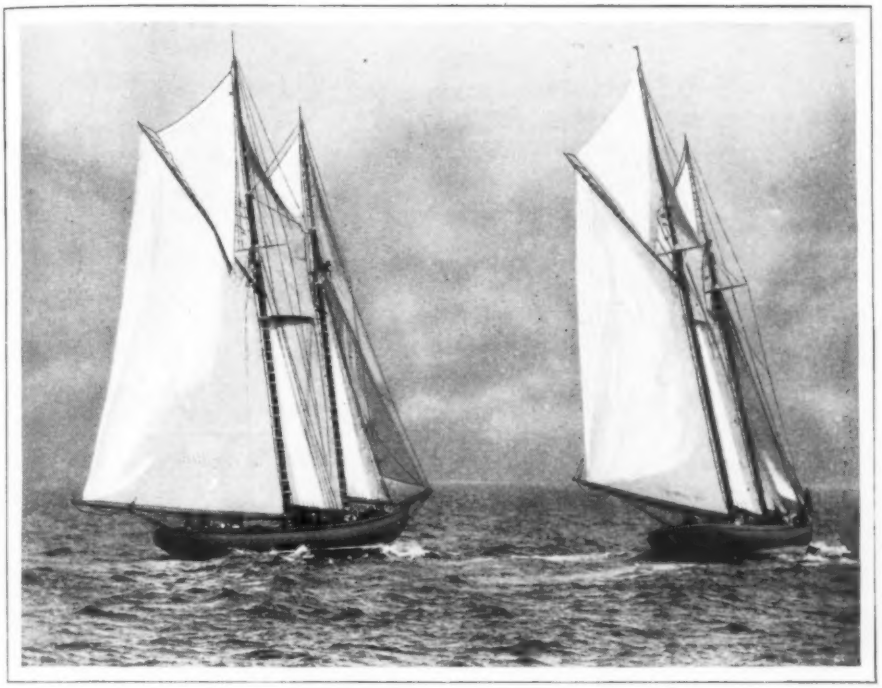
Now the motor of the plane catches hold once more and away it soars, turning high circles, reaching for the fleck of cloud that has been driven down from the blue. The pilot smiles to himself as he gazes first from one side of the cockpit and then from the other. He leaves the fleet miles behind. He scribbles a note to his observer, who sits below him with the radio operator. "Keep a sharp lookout for mackerel." "O. K." comes the answer.

The radio operator sits in front of his transmitter. They are in the compartment below and to the rear of the pilot's cockpit. At the right hand of the observer is a rack containing binoculars and writing pads. Near it is the speaking tube to the cockpit which is used, of course, only when the motors are silent. At his left hand is a small cage, made of wire and wood, where sits a silver-necked homing pigeon, much at its ease.

Now the ship's blunt nose strikes against the breeze above Stellwagen bank. In the east the fleets fade away. The pilot can see far down into the clear water. A school of tumbling porpoises comes rioting from the west, bound eastward on some silly business of blindman's buff. More majestically sails a huge blackfish, as big as the plane itself, sliding through the waves, blowing lustily with a dash of spray as his curved back glistens in the sunlight.

At this turn, the pilot discovers a new color in the blue water. It is a patch of darker shade and extends from west to east for a quarter of a mile. Down goes the nose of the plane. Swiftly it circles nearer to the ocean. The wind screams in the struts. The patch of dark color takes on a phosphorescent glow. Its shade becomes bluish-black. Leaning far over the side of the cockpit, the pilot gazes down. A broad smile comes upon

A Stormy Day for Flyers, but Lieutenant Melka, Right, and Commander Paulsen, Left, Get Ready for a Flight When the Radio Warns of a Ship in Distress



Beating Up and Down the Coast, Sometimes for Days, the Fishing Boats, When the Radio Tells the Location of a School of Mackerel, Make Haste to the Spot

his tanned face. He is almost sure. A moment more of swooping descent—and he is sure! He sees a mass of black objects moving forward. A foam bubbles and creeps and spreads around it in the advance. Mackerel!

Millions of fish are gathered in the wide turmoil. Now and then a big mackerel throws itself over the backs of its myriad fellows. And as the plane comes nearer, again with motors silent, the pilot sees that the school is a monster of its kind. Thousands of dollars swarm there. The treasure of the sea waits to be taken. Far off the fishermen lie idle.

Another note is passed to the radio operator: "Report to base the presence of large mackerel school four miles west of Stellwagen banks." While the operator is speaking into his transmitter, the observer has written the report on a tiny square of fine paper which he has thrust into the little tube that the pigeon carries attached to its leg. He then leans out of the opening in the side of the ship and skillfully "tosses" the bird.

With wings folded tight, the homer dives straight down to the sea, almost within reach of the spray of the waves. He circles three or four times and then darts toward the pigeoncote on Ten Pound island, at Gloucester.

The message into the transmitter continues: "Base No. 7. A-25 calling. A-25 calling. Base No. 7, come in. Base No. 7, come in, please."

Now he stops and listens. No answering voice comes. Again he renews his signal. Then from his earphones a voice calls clearly: "A-25. A-25. A-25. Base No. 7 calling. Base No. 7 calling. Come in. Come in. Come in."

They begin to talk: "A-25 on patrol wishes to report to the base the presence of a large mackerel school four miles west of Stellwagen bank."

Base No. 7 repeats the message. A word or two of other matters are passed

Returning to Hangar after a Successful Search for the Mackerel Schools

between the radio man in the plane and the operator on Ten Pound island.

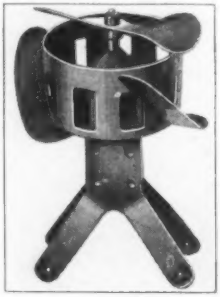
The plane soars back to height again. Lieutenant Melka gazes back at the fishing fleets, almost hull-down but plainer to the eye of the pilot as he gains altitude. The plane's radio operator listens to the broadcast of the Gloucester station: "The Master Mariners association of Gloucester has requested this station to broadcast to the fishing fleet a report from air patrol from coast-guard Base No. 7, Gloucester, that a large school of mackerel is moving in the vicinity of four miles west of Stellwagen bank."

The speed of radio is instantaneous. It will be an hour, perhaps, before the pigeon flutters down into the coast-guard pigeoncote and waits for the removal of its message tube. But already the fleet has sprung into life. The auxiliary motors sputter. Far up in the air, the pilot gazes down and sees the blue smoke from the exhausts puff out over the white wakes as the ships glide forward. Cheerily the men shout to one another as the schooners get under way. They have the word. Mackerel!

Between the two converging fleets of fishermen the patrol plane now comes. Wild cheers greet it from the tipping decks of the schooners. Shouts and queries are sent up from mighty lungs. But the coast guardsmen are at work again. A wave of the hand that signifies, "Glad to help," and off goes the great plane on the wide sweep of patrol.

AIRPLANE SIREN WARNS PILOT OF STALLING DANGER

Warning that an airplane's speed has dropped to a point where there is danger of stalling is given by an automatic siren which sounds only when the air speed drops below a certain rate. The screech of the siren can be heard above the noise of the engine and the instrument is adjustable to any plane. The apparatus consists of two concentrically mounted cages, one moving clockwise and the other counterclockwise. The inner cage is mounted against a spring and above stalling speed is forced back by the airflow against a cork friction ring, but when the speed is decreased the spring forces the inner cage forward until it is rotated and the noise starts.



LOWEST PLACE IS THE SAFEST IN A THUNDERSTORM

Safety from lightning in a thunderstorm will be found in the lowest possible place, says an official of the weather bureau. He advises the person caught in an electrical storm to seek a low place and sit down, or even lie down. Nothing, particularly not an umbrella, should be held above the head. If the person is soaked to the skin, he may find relief in knowing that the wetting is a further protection, because wet clothes are good conductors.

CYLINDER LIKE AN AUTO MOTOR ACTS AS HAMMER

Tamping down paving stones without lifting, and dropping a heavy weight, is accomplished in Berlin with a ramming machine weighing about 200 pounds, which operates automatically. The heavy rammer has in its middle a single cylinder, like that of a motor car, and gasoline tank, and the worker carries batteries in a case on his back, operating the ignition by pressing a lever with his thumb. The piston throws an iron bolt at the bottom of the rammer against the ground and the whole apparatus jumps upward about eighteen inches from the impact, then tamps the paving blocks as it descends.

Machine for Tamping Paving Blocks Contains a Cylinder Like an Auto Motor, to Operate It

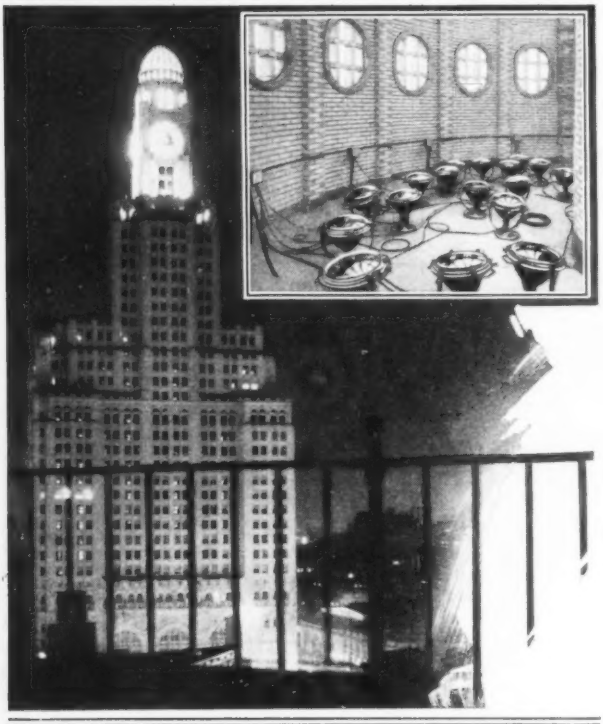
A National Highway Was Rerouted to Preserve This Balanced Rock as a New Mexico Landmark

BALANCED ROCK IS PRESERVED BY REROUTING HIGHWAY

Monument rock, a natural pillar of shale and sandrock, near San Jon, N. M., has been saved as a landmark even though it was necessary to reroute a United States highway to do it. Engineers found that a logical tangent for a road would necessitate destroying the balanced rock and put two curves into the road to preserve the stone, which to the casual observer appears about to fall at any minute. Careful measurements, compared with measurements taken years ago, show that the rock is likely to stand for a long time to come

PRICKLY PEARS AS STOCK FEED

After South African farmers had spent years in vain endeavors to clear their lands of a species of cactus, known as the spineless prickly pear, it is now being cultivated for use as both food and water for cattle during prolonged drouths. It contains a large percentage of water and mineral salts, and has been the means of saving the lives of hundreds of cattle during dry periods, which sometimes extend for as long as two years.



Courtesy General Electric Co.

Lights Illuminating This Tower Are inside the Dome, Which Is of a Shutter-like Framework through Which the Light Passes

DOME'S OUTSIDE ILLUMINATED BY INSIDE FLOODLIGHTS

Internal floodlighting has been used to illuminate the outside of the dome of a Brooklyn bank building. The dome is not of glass, but its curved surfaces are built up of horizontal louvers, or sloping overlapping sections of metal. Viewed by an observer from any point below the level of the dome, these louvers overlap and their gilded surfaces appear to the eye as a solid gilded dome. The surfaces of the louvers are lighted by lamps placed on the floor within the dome, and colored lights, through a cycle of automatic changes, give a variety of effects.

¶Wire automobile wheels are being made from a high nickel, chromium, steel alloy that neither stains nor rusts.

SHIPBUILDERS VIE FOR ATLANTIC RECORD

Ocean liners propelled by steam turbines developing up to 160,000 horsepower are in prospect as a result of the records hung up by the German ship "Bremen." When the "Mauretania" was built twenty-three years ago its engines developed 75,000 horsepower, more than double the power of any turbines then in existence, and it was predicted that the vibration would shake the ship to pieces. Yet the "Bremen," which raced the Atlantic in less than five days, has turbines of 96,000 horsepower, and passengers said the vibration was not disagreeable. At present the White Star line is building the "Oceanic," a vessel of 60,000 tons, which, it is reported, will be propelled by the largest Diesel-electric marine plant ever built, and the Cunard line is planning one or more ships even larger, to be propelled by steam turbines developing 160,000 horsepower, or twice as much as the "Mauretania." The race among shipbuilders to reduce the time of passage across the 3,000-mile expanse of ocean recalls that the first steamship to cross the Atlantic took twenty-six days. Columbus made the passage in a little more than two months and until scarcely a century ago many sailing vessels consumed almost as much time, although clipper ships often made better speed than the early steamers, one of them making the trip in thirteen and one-half days. The American-built "Savannah," only 100 feet long, was the first steamer to cross, but she used sails to assist her paddle wheels in rough weather. The little boat "Sirius" was the first real liner, and in 1838 reached New

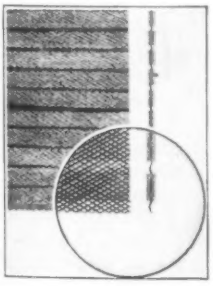
York from Queenstown in eighteen and one-half days, but the "Great Western" came into port a few hours later with a record of thirteen and one-half days from Bristol. In 1864 the time was cut to less than nine days, and in 1872 it was further reduced by the White Star line to a trifle under eight days. The "Oregon" made the Queenstown-New York run in 1884 in six days, nine hours and forty-eight minutes, and five years later the record was set at under six days by the "City of Paris." The rivalry finally resulted in the building of the "Mauretania" and "Lusitania," and now liners are planned to materially reduce all records.

PLANE BEATS HOMING PIGEONS

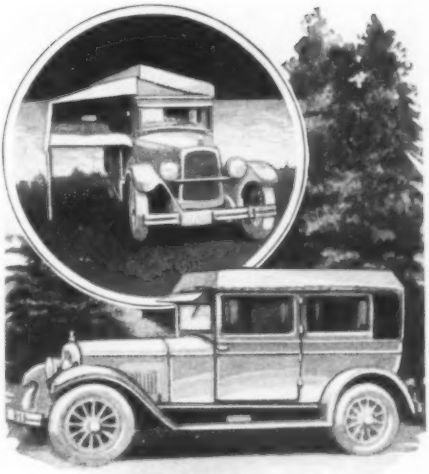
Man scored another victory over nature recently when an airplane won in a race from Chicago to Detroit with four homing pigeons. The birds, long considered faster than planes, were released by the pilot as he stepped into his cockpit, but the first one did not reach Detroit until an hour and nineteen minutes after the plane arrived. This bird previously flew from Fort Worth, Tex., to Detroit in four days and eleven hours.

STEEL MESH WITH FIBER COAT MAKES PLASTER BASE

Steel mesh coated with bands of pressed fiber is being used by contractors as a plaster base to provide fire resistance, sound-deadening and rat-proofing of walls.



The rigid steel mesh is supplied in sheets of two square yards, and makers claim the base not only affords more substantial construction, but results in plaster economy in addition to other advantages. The mesh is not subject to weather changes and neither shrinks nor swells, while overlapping at joints eliminates joint cracks. The fiber-coated back of the mesh base prevents plaster from penetrating or falling.



A Camper's Bed Which Is Stored on Top of the Automobile When It Is Not in Use

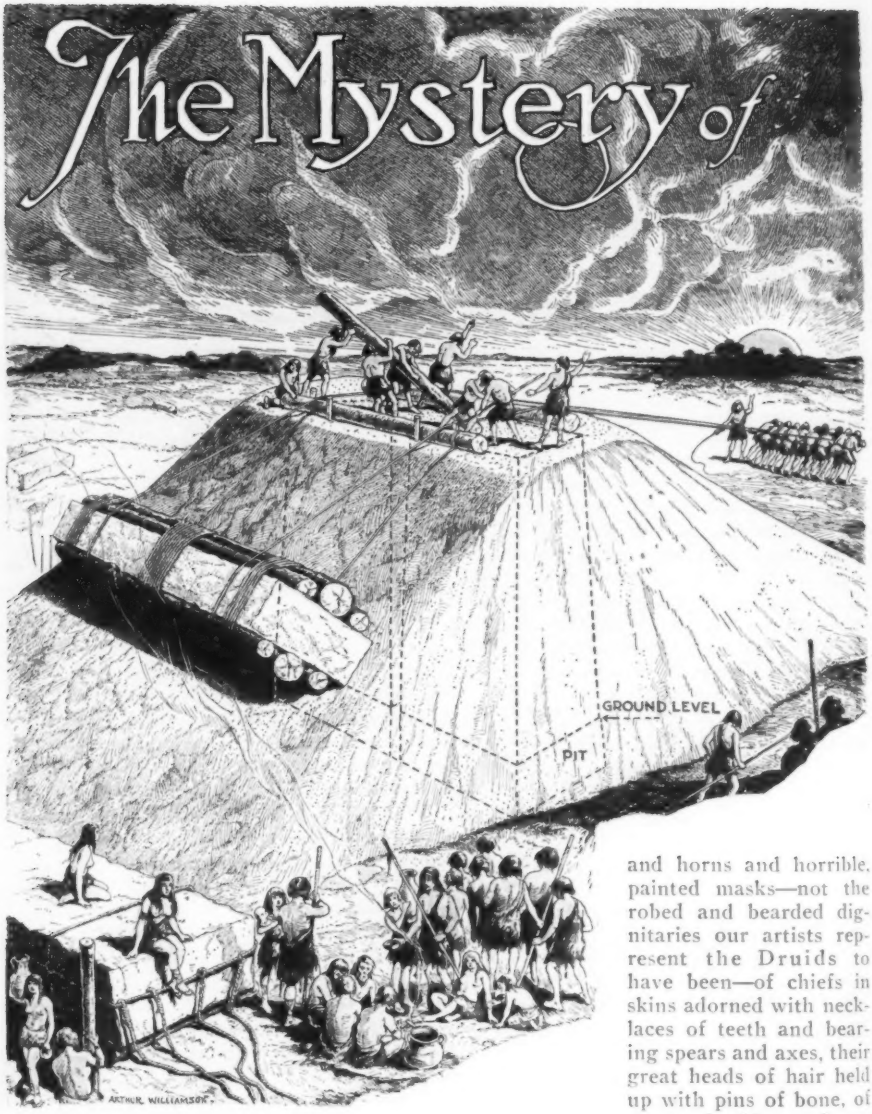
CAMPERS' BED ON TOP OF AUTO GIVES MORE SPACE IN CAR

Prepared for occupancy in a few seconds, a comfortable bed for campers is carried on the top of the automobile, leaving all space in the car available in the daytime. The bed, equipped with spring and mattress, rides in a hangar placed on wooden slides to which clamps are attached to hold it rigid. When the bed is set up, one side rests on supports on the car just above the fenders. A waterproof tent with netting windows also fits over the bed and is attached to the car, this being carried in the hangar in the daytime or used as a fly tent. The roof that covers the bed is of regular auto-top material and is supported by a light wooden frame.

A CLOTHESLINE WITHOUT PINS

Clothespins are unnecessary with a clothesline made of two strands of wire twisted together. Between the wires runs a brass separator consisting of two small wheels on an axle, the clothes being placed between the wires as the separator is pushed along the line, while the latter closes to hold the wash as the separator is moved. The separator also cleans the line as it is moved along the wires.

The Mystery of



"AWAY beyond the dawn of history, 3,000 or 4,000 years ago, one thinks of the Wiltshire uplands in the twilight of a midsummer day's morning. The torches pale in the growing light. One has a dim apprehension of a procession through the avenue of stone, of priests, perhaps fantastically dressed with skins and horns and horrible, painted masks—not the robed and bearded dignitaries our artists represent the Druids to have been—of chiefs in skins adorned with necklaces of teeth and bearing spears and axes, their great heads of hair held up with pins of bone, of women in skins or flaxen robes, of a great peering crowd of shock-headed men and naked children. They have assembled from many distant places; the ground between the avenues and Silbury Hill is dotted with their encampments. A certain festive cheerfulness prevails. And amidst the throng march the appointed human victims, sub-

Stonehenge

Copyright Speedpoints

How the Big Stones May Have Been Set Erect by Dragging Them up Earthen Ramps, and Stonehenge as It Is Today; a Modern Druid Meeting in Progress

missive and helpless, staring toward the distant smoking altar at which they are to die—that the harvests may be good and the tribe increase. To that had life progressed 3,000 or 4,000 years ago from its starting place in the slime of the tidal beaches."

So wrote H. G. Wells, the famous novelist and historian, and that is one theory—a very probable one—of the mysterious origin of Stonehenge, the strange stone circle in Wiltshire, England.

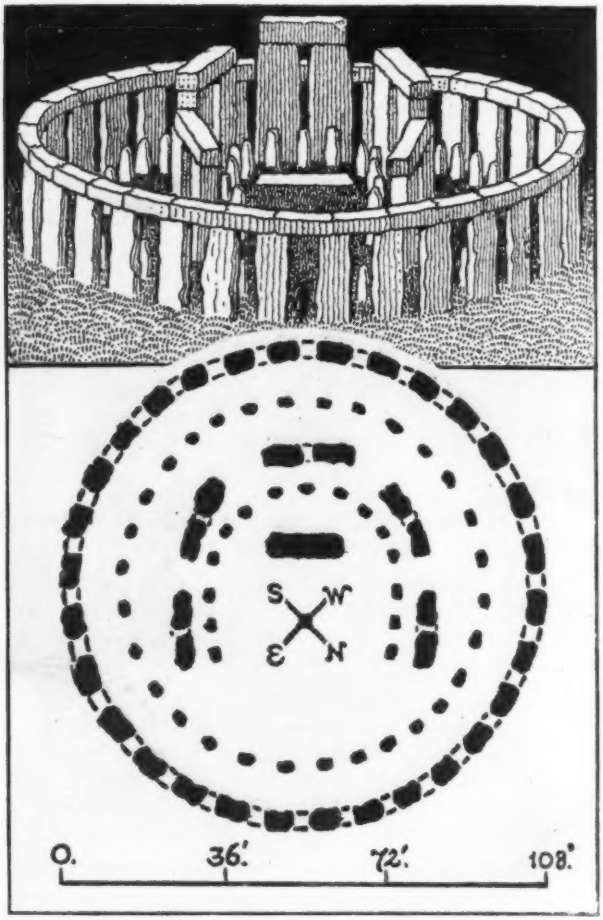
Another theory is that the Druids, or wise men of the ancient Britons, described by Julius Cæsar as living in dens and woods and caves, built Stonehenge as an astronomical observatory or temple.

As a matter of fact, Inigo Jones, architect of King James I of England, who investigated this strange circle, knocked the Druid theory of the origin of Stonehenge on the head, showing that it was built hundreds of years before the rise of the Druids, who, however, may have used it.

Some 12,000 to 20,000 years ago, a new Stone-Age people, who made polished stone implements and began to domesticate animals, arose either in the now submerged Mediterranean basin, or in western Asia, or north Africa, and gradually spread eastward over Europe, which was recovering from the last great Ice Age. They began to sow and harvest grain, and by some strange process of reasoning conceived that the sacrifice of a chosen human being would conduce to a successful harvest. These people developed what Prof. Eliot Smith calls a "Sun-Stone" culture, and wherever they migrated, set up vast pyramids and mounds, and circles of big stones, perhaps to aid the astronomical observations of their priests or wise men.

They were a dark curly-haired folk with round heads and skulls broader than long. Preceding them in Britain, an earlier race of long-skulled men with fair hair, who tended flocks, had built a vast circle of stones on Salisbury plain, not far from Stonehenge. Today, only about twenty out of the original 600 enormous stones remain at the original site. Circles of such stones also are found in Cornwall and Wales. They were objects of worship and were believed to possess magical or medicinal properties.

The fame of the stone circles spread all over Britain and reached the ears of the men on Stonehenge Down. The Bronze Age was just beginning, when, it is surmised, the folk of Stonehenge—then a center of manufacture of stone tools, axes, and weapons—made a raid on such a cir-



Stonehenge as It Probably Was Some 4,000 Years Ago, and Plan of Original Structure with Scale

cle of blue stones in the Prescelly mountains of Pembrokeshire, South Wales, 170 miles overland from the Wiltshire plain.

A fierce battle was fought between the fair-haired long-heads and the dark men of the round-headed invading race, and 115 of these blue stones were taken by sea from the coast of Wales around the shores of the English Channel to the mouth of the river Avon, in Hampshire. Up this little river, the foreign blue stones were sent on rafts to West Amesbury in Wiltshire.

Recently, a British government airplane, surveying and mapping the North Wiltshire country, took photographs which revealed hidden lines indicating the old trackway over which the stones were dragged on rollers by Stonehenge men pulling on ropes of hide. Excavators have confirmed this fact.

Today, Stonehenge is bounded by an earthwork, 300 feet wide and approached from the northeast by a banked avenue of great width. At first sight, a chaos of fallen and upright stones meets the eye. The approaching visitor sees a large, unworked stone called the "Hele stone" or "Friar's heel." Hele is an Anglo-Saxon word suggestive of the Greek word Helios, or sun. The Hele stone, over which the sun appears to rise at midsummer-day dawn, is some yards outside the earthwork.

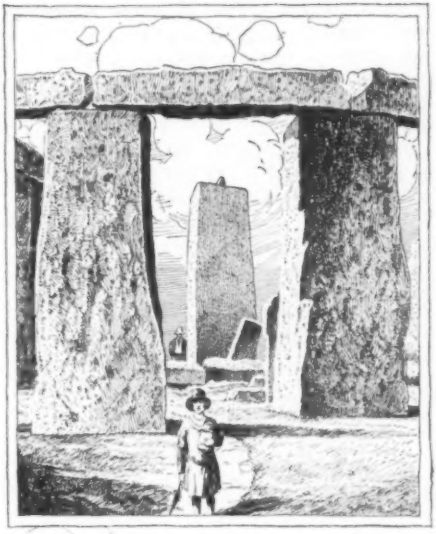
Passing inside the earthwork, the visitor sees on his left a great block, called the "Slaughter stone" and thought to have been used as a place of execution. This stone is one of the mysteries of Stonehenge. Excavations under the Slaughter stone have shown that the ancient builders intended to bury it in a hole roughly dug in the chalk, and just deep enough for the soil to cover the stone at ground level. But the builders made the hole too short, and so the stone rests on the sloping chalk at either end.

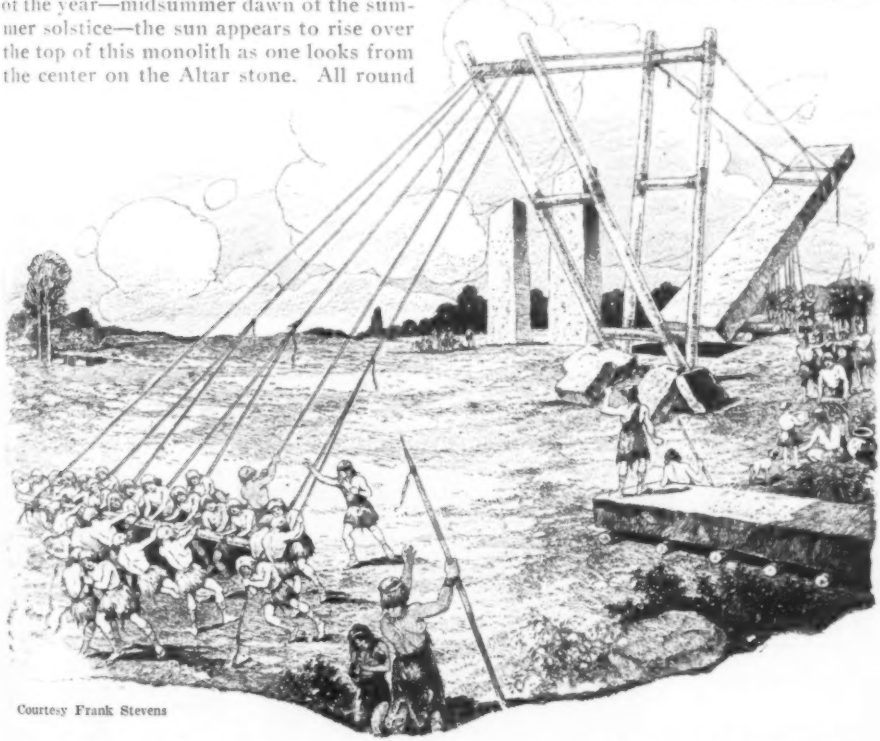
On the outside of the circle, and within the 300-feet-wide circular earthwork, are two rough, unworked stones, one of which appears to mark the rising of the sun on the winter solstice, and the other its setting on the summer solstice. Then comes a ring of unhewn stones, about twenty-one feet high, standing upright,

with lintels mortised to their tops. The diameter of the circle is 108 feet.

Next comes a ring of hewn stones brought by sea from Wales, of which seven are still standing, and nine prostrate, out of the thirty or forty original stones. Behind these, in the next circle, once stood five great trilithons in horseshoe formation, opening to the northeast. Inside the site of these trilithons, of which only one still stands, is a ring of smaller upright stones, also in horseshoe formation.

Then the eye falls on a singular, flat block, called the "Altar stone," almost buried beneath the remains of a fallen trilithon. It is possible that this stone may have been a roster or platform. There is no proof that it ever was upright. Looking northeast from this slab, through the arches of the outer circle, one can see the Hele stone, or Friar's heel, some way distant on the plain. On the longest day of the year—midsummer dawn of the summer solstice—the sun appears to rise over the top of this monolith as one looks from the center on the Altar stone. All round





Courtesy Frank Stevens

Sketch of the Huge Blocks as They Appear Today, and Another Solution of the Construction Problem, Tipping the Stones into a Pit with the Aid of Tackle

on the plain are great numbers of prehistoric burial mounds, or barrows, which may house the long-dead builders of Stonehenge, or may be the graves of the famous and forgotten chieftains of the new Stone Age.

The engineering of Stonehenge is remarkable. How were the great trilithons raised when men had none of the derricks, slings and electric hoists of our modern days? The only tools used were crude hammer stones or mauls of flint. E. H. Stone, an English engineer, suggests that a man of extraordinary ability designed and supervised the erection of the stone circles. Foremen or overseers measured the sites for the foundation pits of the great monoliths and trilithons, while other men dressed the great stones, shaped and repaired the stone and flint tools, dug the foundations, and lugged the stones into place. No articles of metal have been found near the site of Stonehenge, showing that no Bronze-Age men using metal tools were employed.

The stones probably were split in a way similar to that still practiced in parts of modern India. Men stood in a line across the stone. Each one held a stone maul above his head, gripping the tool with both hands, and at a signal from the overseer each man simultaneously dashed his maul on the slab, and so split it across. Quartz mauls have been found at Stonehenge, showing signs of this terrific battering. Then, the stones, resting on timber rollers, were tugged across country by men pulling on ropes of hide.

The difficulty of the job can be judged from the fact that each of the trilithon uprights weighs forty tons, and each block and lintel weighs twenty-six tons. Seventy-five blocks were needed, so that the total weight of these alone was 1,950 tons. The master engineer probably laid out the design of Stonehenge by marking the circles with a rope staked to a center on the ground of the site. The great circle was divided into thirty equal parts and the space for the stones marked out on the ground. His first problem was how to erect the forty-ton uprights.

These great stones were of different heights, but it was arranged that the tops of the stones forming the seatings for the lintels should, after erection, be as nearly as possible at a uniform level. To do this, the foundation pits had to be dug at varying depths, according to the lengths of the stone uprights. The bottom of the pits

Courtesy Frank Stevens

The Mysterious Blocks of Stonehenge as They Are Today over the Wiltshire Downs; Possibly This Strange Structure May Have Served as a Place of Sacrifice of Human Victims on Each Midsummer Day When the Sun Rose over the Plains; the Upright Megaliths Are Over Twenty-Two Feet High and Several of the Lintels Are Still in Place

was carefully excavated to correspond with the shape of the bottom of the stone, so as to secure a firm foundation. Round the pits, the ground was rammed hard as a platform for the stone. Then, the great stones, on rollers and with the flat-dressed face uppermost, were rolled over the floor, each stone end on, and so balanced as to tip itself into the pit. Mr. Stone suggests that a rough derrick, made of a pair of timber sheer legs, was used to raise the stone erect.

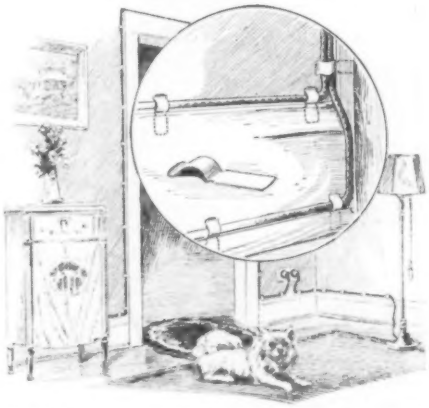
There is no direct evidence to show how these Stone-Age men got the lintels on top of the uprights, twenty-two and a half feet high. Mr. Stone believes a bank of earth was thrown up around each pair of upright stones. The top of the earth was rammed flat to make a working stage, above which the tops of the big uprights projected a few inches. The bank so ringed in the uprights as to exert equal pressure on all sides, and hence not shift the upright on its foundation. Then the lintel was pulled up the sloping side of the bank and set on top of the upright.

The visitor sees, just inside the earthwork circle of Stonehenge, a puzzling series of twenty-three holes in the chalk. Most of these contain cremated human remains, and in three the signs are that the cremation was done on the spot.

The mauls used in dressing the great stones weighed from thirty-six to sixty-four pounds and were wielded by two to three men. Picks of deer horn may have been used to cut the holes for the foundations of the uprights, since splinters of horn have been found in these pits.

Even today, after years of patient research, scientists do not really know the exact purpose for which Stonehenge was built, nearly 4,000 years ago. Was it intended for a court of justice, a hall for ceremonial meetings of chiefs and kings, a sun temple for sacrifice of human victims, or a hall for the rites of the dead? No one is sure.

RADIO WIRES KEPT OFF FLOOR WITH BASEBOARD CLIPS



Metal Clips Inserted in Baseboards Keep Radio and Telephone Wires off the Floor

Clips that may be inserted in baseboards, door frames and moldings serve to keep lamp, radio and telephone wires off the floor. The metal fasteners are slipped into the space between the trim and the wall, the top being bent to receive the electric-light cord.

TALKS TO LONDON FROM PLANE FLYING OVER NEW JERSEY

Talking with persons in London while soaring in an airplane 2,000 feet over Hadley field, N. J., was accomplished recently by a hookup of radio and long-distance telephone wires. The London call from the man in the plane was sent to the Bell laboratories' ground station at Whippany, N. J., by radio and there picked up and relayed over transatlantic wires. The call was completed in a few seconds, but the first conversation was hampered by considerable interference, although the voice from London was distinct.

Airplane Passengers Talking with London by Telephone and Radio While Flying over New Jersey

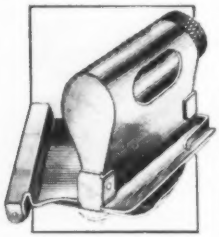
Memorial of Some Long-Forgotten Event, This Sixty-Foot Monument Stands in the Holy Land

FORGOTTEN STORY OF ANCIENTS TOLD BY MONUMENT

Built to commemorate a forgotten event, an ancient monument stands near the ruined city of Baalbeck, Syria. It is sixty feet high and on its sides are sculptured hunting scenes and hunting regalia, but of its origin, age or its builders, nothing is known.

MOISTENER SEALS ENVELOPES AND CLOSES FLAPS

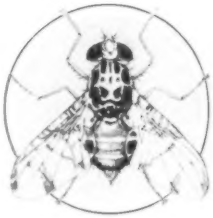
Sealing envelopes in the busy office is accomplished quickly with an automatic moistener which not only moistens the flap but closes it securely so that a slight pressure on a pile of finished letters is all that is required, thus keeping the envelopes clean as well as eliminating sealing by mouth. The sealer consists of a metal container in which a supply of water is kept, the moistener responding to a pressure of the thumb when more water is wanted on the felt pad used for sealing. The moistener is mounted above a frame shaped like a lip through which the flap passes to be sealed.



SUBMARINE BLOWN TO SURFACE WITH CREW IN TESTS

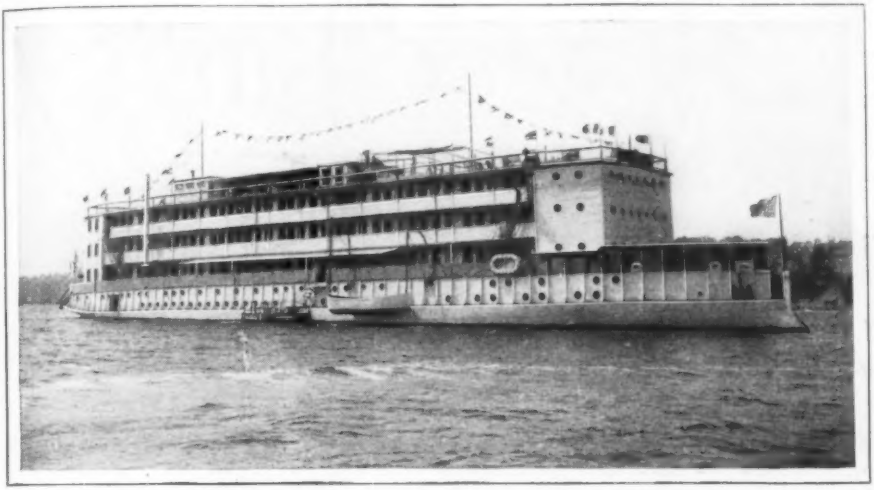
America's largest undersea fighting craft, "V-4," was rescued from the deep by being blown to the surface with her crew of eighty-seven officers and men in tests off San Diego, Calif., hailed by naval authorities as marking another step to make these craft safer. Fresh air was supplied to the submarine's compartments, the old air was exhausted, and finally the sub and its crew were brought to the surface by compressed air lines from the rescue vessel which blew the ballast tanks of the boat eighty-six feet beneath the surface. Thirty-nine minutes after the submarine settled to the bottom a diver from the rescue boat was on its deck and had connected an air hose to its salvage valves. Fresh air was sent into one compartment and then another, and finally the air was pumped from one compartment into another and completely through the vessel. Air pressure then was applied to the main ballast tank, and twenty-three minutes later there was a rush of foam and the submerged boat was afloat without any action on the part of its crew.

WAR ON DREADED FRUIT FLY WAGED IN FLORIDA



Described as the "gaudiest lady and the most damaging pest of Bugville," the Mediterranean fruit fly is being attacked in Florida by an army of 5,000 scientists and workers equipped with chemicals, sprayers and other impediments of war. The dreaded fly succeeded in almost ruining the citrus crop before the counteroffensive was started, state and nation having placed a fund of more than $5,000,000 at the disposal of the attacking army. It is the female that does the damage, laying eggs in seventy-two kinds of fruit, including the orange, lemon, grapefruit, pear, plum and apple. Strict quarantine was one of the measures taken, with the state militia seeing that it was maintained.

OLD WARSHIP IS TURNED INTO FLOATING CLUB



The U. S. Monitor, Which Guarded New York Harbor during the World War, Has Been Transformed into a Floating Country Club and Serves as a Summer Resort for Long Island Society

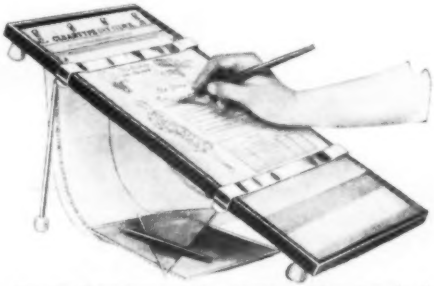
Transformed into a floating country club, the former U. S. monitor, which guarded New York harbor from submarines during the World War, is now utilized as a summer resort for the social elite of Long Island.

PLAN FILMS OF LIBRARY BOOKS TO CONSERVE SPACE

Confronted with the prospect of "drowning in books," librarians of the Berlin state library have advanced a plan for photographing the books and storing the celluloid film to save space. Books photographed page by page on a celluloid film, it was found, could be stored in less than one-fortieth of the space needed for the printed volumes. Old and precious examples of the bookmakers' art, when photographed, would need no longer be exposed to the wear and tear of usage, and new books, having no particular intrinsic value, could be destroyed after being filmed. The photographic system would first be used for books seldom called for and a special film-reading room would be established for the celluloid library. A small projection machine beneath each table would throw the pages on individual screens so students would be able to read while seated comfortably in armchairs, the book film operating like a movie film.

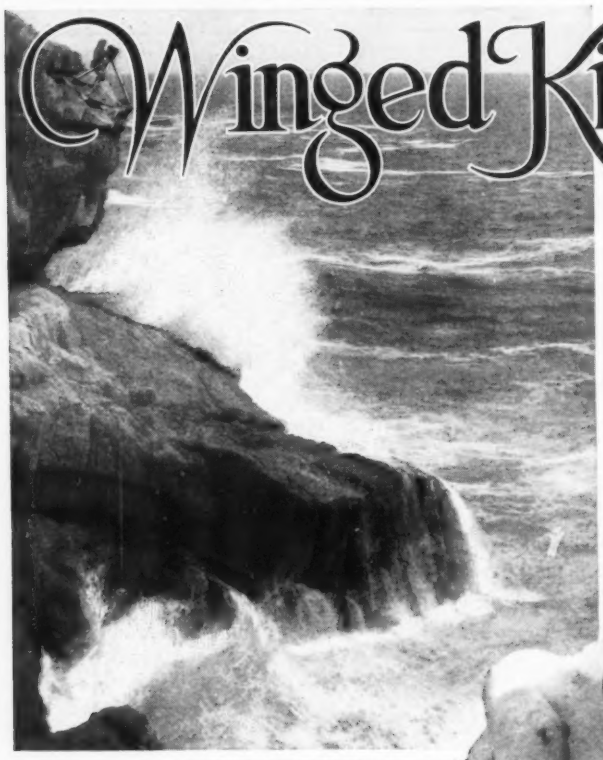
FRAME FOR TRACING STENCILS MAKES DUPLICATING EASY

Tracing drawings, art work and maps on stencils is simplified with a tracing frame, adjustable in six positions, in which the stencil is locked by two clamps. It may be used for any type of rotary duplicating machine, the equipment including a glass with a ground surface to insure sharper lines, a transparent celluloid tracing sheet and celluloid triangle for ruling.



Tracing Drawings and Art Work on Wax Stencils Is Made Easy with This Tracing Frame

Winged Kings of



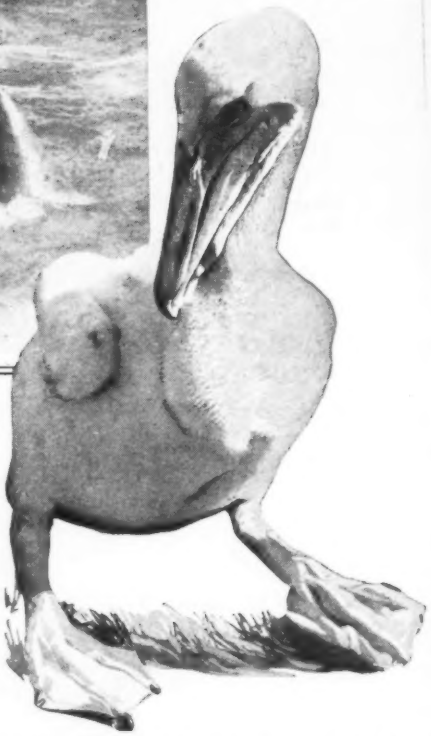
Young California Brown Pelican, and a Rugged Bit of the Coast along the Bird Retreat

By H. H. DUNN

Photography by Lee Passmore and the Author

RULED by several pairs of bald eagles, whose ministers of war are ospreys, five small islets, ten miles off the western coast of Mexico and twice as far south of San Diego, form the most complete bird empire in the world. Into this harshly dominated kingdom, mammals, even man, have not entered, with the exception of one small variety of field mouse, and several herds of sea lions.

Protected by the government of Mexico, and watched over by that of the United States because of their inviting possibilities as centers of smuggling operations, these five Coronado islands are so surrounded by red tape that few, save scientific expeditions, ever visit them. Unlike other "bird islands," occupied only by sea flyers, here the shore, land and ocean birds live side by side, an interesting and unique example of the manner in which wild life rules itself when completely free from man's influence.



Rising straight from the sea, composed of granite—the "backbone of the Earth"—covered with a scant layer of soil, in which grows low brush, the Coronados offer few landing places, there being only

a Bird Empire

Pelicans and Gulls, the Nesting One "Talking" to the Photographer; Pelicans Attain Nearly Full Size Before They Discard the Down of Babyhood or Are Able to Fly

one on North Island, the largest of the group, and one on South Island, next in size. At the former, an expedition from the San Diego Museum of Natural History landed recently. A few of the results, some of them the first photographs of their kind ever made, are shown herewith.

An estimate, made by trained observers, places the winged residents of the Coronados at 100,000. One of the mysteries of the islands is the presence of several flocks of California valley quail. If they arrived there in recent years, they must have flown at least ten miles from the mainland; if they were there when the islands were separated from the continent, as the floor of the sea sank, they are indeed old-timers, for this parting occurred, according to the geologists, not less than 10,000 years ago.

On this same island, too, are the smallest birds in the world—hummingbirds. They are not so mysterious, for they fly annually hundreds of miles in their migrations, but the quail are not migrants.

This avian empire is divided into distinct states, territories, zones, or whatever one wishes to call them, each inhabited by one variety of bird—with the exception of the gulls, which, preying on all their neighbors, nest where they please, rob whom they please, and generally lead the lives of winged "racketeers." First and closest to the shore come the Brandt cormorants, flyers, underwater swimmers, divers and the best fishers of all birds.

In years past, these cormorants nested by thousands on the flat shelves of the Coronados; today there are only a few hundred, due to the depredations of the great black-and-white w stern gulls. Here, at the very boundary of the Bird Empire, we began to see the workings of its government. As we stood photographing and counting the cormorant nests, one of the birds appeared, loaded with a fish, driving at top speed from the sea toward her home. Before she reached the land,

Playful Sea-Lion Pups Parked in a Stone-Walled Refuge of the Bird Empire While Their Mothers Go Fishing

a gull fell upon her, and as the cormorant released the fish, the gull dropped to the water, seized the booty and rose in the air. There was a scream from above, and an osprey, watching from the cliff four hundred feet higher, struck at the gull. In and out and round about they went, cutting circles, loops and spirals in the air until the gull, turned from her own nesting place, put out to sea.

The osprey followed, flying beneath the gull and driving her ever upward, until at last the first robber dropped the fish, while the pursuer, folding his wings, fell faster than the falling mackerel, took it in midair, and rose on a long slant toward the cliff. But he was not to enjoy his loot. From far aloft there came, in total silence, but with the speed of a ten-inch shell, the body of a bald eagle, folded compactly into a living spearhead, with a snow-white point. Passing within what seemed to be inches of the osprey, the eagle found wing, turned upward, and struck at the fish in the hawk's beak.

The osprey dived, swerved, lifted, at a speed which would have taken the swiftest duck, but the eagle was always with him, always screaming, always striking, until he also dropped the thrice-looted dinner. Then the eagle, again folded into the spearhead, fell, seized the fish before it struck the water, and zoomed in a thousand-foot rising slant, to scream in triumph as he sloped down again to his mate and nestlings on the lofty ledge. So life goes in the Bird Empire: rob or be robbed; kill or be killed; survive by wit or wings, or both, or perish as unfit.

Rather sharply cone-shaped, the eggs of the gulls offer an interesting phase of nature's protection for bird life. Being of this contour, if one or all start rolling, they wing in circles, on the smaller end as a center, coming back to their original position. Thus, on bare ledges, or in scanty nests, or when disturbed by the sudden rising of the parent bird, the eggs do not roll away. More than this, their tendency being to roll together, they remain in the center of the warm area of the mother's body, thus aiding incubation.

Sea-lion puppies, one-third grown, snapped at us when we undertook to play with them, some fifteen being parked in a small stone gully, while the mothers went fishing out at sea. A huge brown pelican waddled along beside us, as if familiar with man. Suddenly there was a whimpering in the air, and from the earth-covered slopes above, little murrelets and Cassin auklets by thousands began to pour from their burrows for their flights. Night had come to the Empire of the Birds.

¶Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished free upon application to our Bureau of Information.

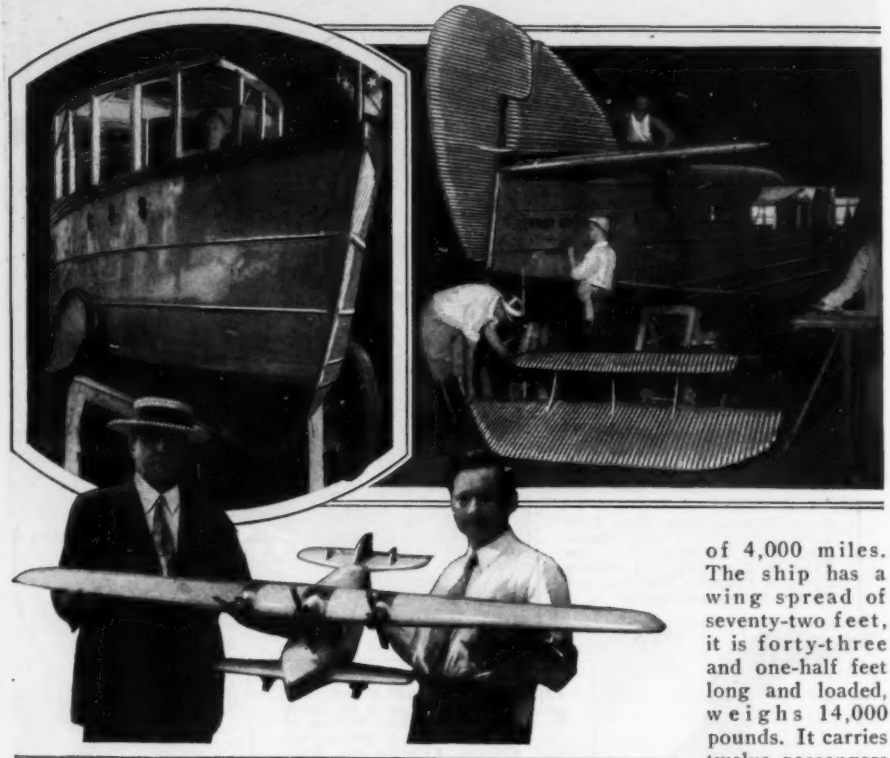
Anna Hummingbirds, Fast Outgrowing Their Nest; These Diminutive Birds Evidently Cross the Channels Separating the Islands from the California Mainland and the Mexican Shore

California Valley Quail Play Tamely around the Photographer on South Coronado Island; Here Is One of the Cocks of the Flock Which Does Not Migrate, Although the Minimum Flight from the Mainland Would Be About Ten Miles; Below, at Left, a Murrelet, Pulled from Its Nest in a Hole in the Rocks

Four Hours of Patient Stalking, Most of the Time Prone on the Ground, Were Required to Obtain This Photograph of the Western Gull with Her Nest and Eggs

Upper Left and Lower Right Photos © Lee Passmore

ALL-METAL AMPHIBIAN TO CRUISE LONG DISTANCES



Views of the Amphibian under Construction and, Below, Erwin Greer, at Left, and J. H. Wendt, Designer of the Craft, Holding a Small Model

Flights over the oceans will be most successful with amphibian planes, in the opinion of many aeronautical engineers, and to further demonstrate the efficiency of these craft, a novel amphibian has been built in the shops of Greer college at Chicago. Outstanding features are its all-metal construction, the elimination of pontoons and the use of two smaller auxiliary motors besides the three 300-horsepower engines in the main power plant. These smaller motors, according to J. H. Wendt, the designer of the ship, will be employed to keep the craft flying once it has attained speed and altitude, so that all the big engines will not have to be run continuously. By this arrangement, a saving in fuel will be effected, giving the amphibian an estimated cruising range of 4,000 miles. The ship has a wing spread of seventy-two feet, it is forty-three and one-half feet long and loaded, weighs 14,000 pounds. It carries twelve passengers and two pilots and is equipped with cabin conveniences of the most luxurious air liners, including radio-receiving and transmitting apparatus.

CITY NOISES TIRE STRANGERS

Visitors in a large city burn up body energy one-fifth more rapidly than average residents because of the effects of city noises upon the nervous system, according to experiments conducted by a neurologist in New York. The city dweller, he found, became immune somewhat to city noises through adaptation, but the stranger responds to the unusual clamor with a reaction which increases or decreases the respiration rate, tends to create abnormal muscle tension and sometimes causes heart changes.

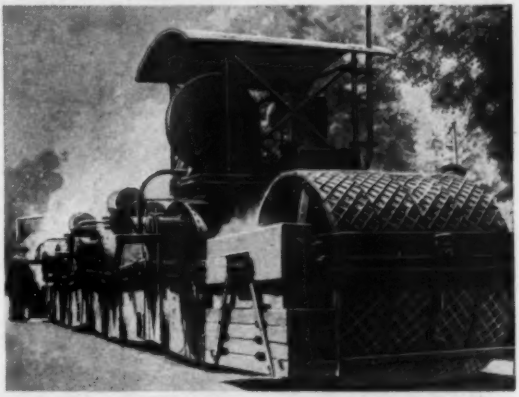
PHONE WIRE ON GROUND HELPS GUARD FORESTS

A forest-fire patrol observation post in the far west is connected with the outside world by a single iron wire lying on the rock and snow of the mountain. Members of the hiking parties that often climb this mountain, observing this wire, are usually unable to understand how a single-wire grounded circuit can operate under such circumstances. The explanation is that very low-resistance iron wire is used and that snow and rock have little conductive ability, hence do not ground the wire. As it is not possible to secure good ground on the top of the mountain, a wire leads from the observation cabin to Crater Rock, 800 feet below, where excellent contact is made in the place where the steam issues from the ground.

VANISHING TOP CHANGES TRUCK FROM CLOSED TO OPEN VAN

Converting a closed truck into an open van is made possible by a disappearing top and collapsible sides, all of which are shoved away out of sight. The roof over the driver's cab is divided into two parts, and it is between these that the truck top disappears. The upper part of the casing over the cab is hinged and may be lifted up. The rubber van top slides on metal crosspieces which are bent around metal rods along the top of each side of the van. Over the topping and crossbars are metal plates, to force the top to fold as it slides back and to prevent the fastenings from working loose. The top also may be entirely removed. The sides are formed of hardwood panels and slide in grooves in the standards to open or close any section. The panels are held in place by setscrews and rubber plates, making each panel section adjustable.

Vanishing Truck Top Which Slides into Roof of Cab to Convert It into an Open Van



This Machine, Resembling a Steam Roller, Marks Crisscross Designs in Asphalt to Keep Vehicles from Skidding

PREVENT SKIDDING IN STREET BY DESIGNS IN PAVEMENT

Streets in Berlin, Germany, are being made skid-proof by a huge machine which stamps into the asphalt pavement a deep crisscross design, the lines of which prevent slipping. The engraving is somewhat similar to the designs on the treads of some automobile tires which are intended for the same purpose. The machine that does the stamping resembles a gigantic steam roller.

QUAIL CHECK POTATO BEETLE

Reluctant small boys who spend many back-aching hours over beetle-infested rows of potatoes soon may relinquish this unpleasant task to the quail or bobwhite. Experiments have shown this attractive game bird has a decided taste for the potato beetles, and if given a chance, will clean them out completely. Where bobwhites are protected by a closed season and increase greatly in numbers, potato beetles have been found to diminish to such a degree that it is no longer necessary to spray vines with poison.

Contrasting in Appearance with the Ordinary Plane Is This Ship with a Flanged Cylinder for a Propeller

PROPELLER LIKE HUGE BARREL TESTED FOR AIRPLANE

Resembling a huge barrel with the ends knocked out, a cylindrical propeller has been tested for an airplane whose construction is in odd contrast to the ordinary plane. Projections inside and outside the cylinder give it the appearance of a turbine flange, and when the cylinder is whirling the flanges operate in a manner similar to a screw propeller. While differing radically from usual methods of construction, the craft underwent successful ground tests recently.

ESCAPE FROM SUBMARINE AIDED BY BREATHING APPARATUS

Successful tests of a breathing apparatus enabling trapped submarine crews to escape from deep water have been made by the British admiralty. Sunk to a depth of 126 feet, those making the tests reached the surface safely in a minute and a quarter. The apparatus, weighing less than five pounds, is attached to the chest and has a flexible breathing tube through which exhaled air is regenerated by absorption of carbon dioxide and restoration of oxygen. At the same time tests were made of a diving apparatus which is said to permit divers to descend 300 feet. The previous record was 204 feet. This appliance reduces to one-third the time of decompression and freedom from the effects of nitrogen. As soon as the diver is ready to come up to the point where decompression must begin, a cylinder with an attendant inside is lowered and this man helps the diver into the cylinder for the decompression period. Its advantage is that it does away with much armor.

LAWN MOWER RUN BY CURRENT FROM LIGHT SOCKET

Lawn mowing is made easier and quicker with an electric mower that is designed like the small hand machine, except that it has a motor that is attached. The mower cuts around shrubbery and hedges better than the hand mower because the blades revolve whether the wheels turn or not. It is light in weight and equipped with rubber tires to avoid noise.

A Hand Lawn Mower with Electric Motor Eliminates Some of the Work of Cutting the Grass

"Blacklight" Spots Planes

COMBINATION of television with "noctovision"—seeing things at night by invisible light—is to be used by the British government to guard England against aerial attack. Searchlights which cast no visible rays will sweep the skies above the Channel coast at night in wartime, pick up invading aircraft with their unseen light beams, and furnish the illumination to transmit the picture of the invader to the anti-aircraft batteries on the ground, to the airdromes of defending pursuit squadrons, and to the war office in London.

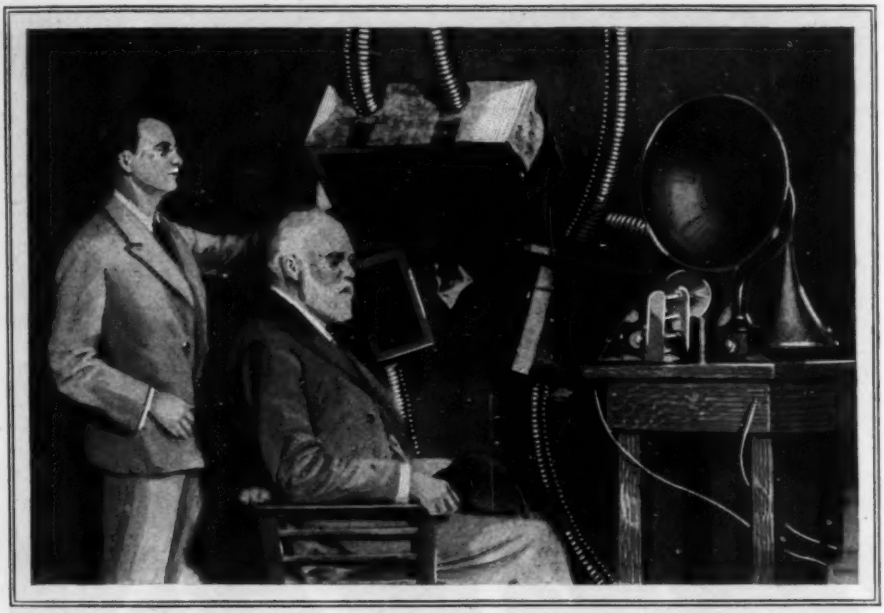
Two devices invented by John L. Baird, the English television expert, are to be combined. Secret tests have already been made before Lord Allenby, the conqueror of the Turks in Palestine; Lord Arnold, Admiral Sir Mark Kerr, Sir Thomas Inskip, Sir Herbert Samuel and others, representing the army, navy and air force. Experiments in long-distance transmission of night scenes are about to be inaugurated between London and New York.

The Baird noctovisor utilizes the invisible infra-red rays—the band of vibrations below the visible red of the spectrum, rays of a wavelength so long the eye cannot see them. They have sixteen times the fog-penetrating power of visible light, which makes them particularly useful in a climate such as England has.

In operation, the searchlight, fitted with carbons which produce large quantities of red light and little of the shorter wavelengths, is covered with a black screen, usually Corning glass, which prevents the escape of any of the visible light. As it sweeps the sky, nothing can be seen, and from above it cannot be detected, save for a tingling sensation in the eyes, if one looks directly into the beam. The sensation is somewhat like the feel of looking into an intense light, though the eye sees nothing.

A photo-electric cell on the ground, however, picks up the image of the plane overhead as easily as though it was bathed in visible light. From that stage on, ordinary television processes complete the transmission of the picture.

The Baird apparatus is still in the experimental stage, but the army, navy and



Sir Oliver Lodge and J. L. Baird Examining Experimental Apparatus by Which Images of Aircraft or Other Objects Are Transmitted on Beams of Invisible Light at Night and Seen on Small Screen

air-force officials who viewed the tests were all enthusiastic about its possibilities in the defense of London from enemy air raids. The air-raid problem has been given intensive consideration since maneuvers last autumn showed that squadrons of planes could penetrate all existing aerial defenses and reach the heart of the metropolitan district with ease.

Navy officers were particularly interested in the possibility of applying the noctovisor to warships. They pointed out that in a battle between two fleets, fought at night, the one equipped with invisible light as eyes would have all the advantage. The ability of the infra-red rays to penetrate fog and smoke screens also would be of great importance.

The use of invisible light rays at sea is not a new thing, for it was first developed during the war by the American navy as a means of keeping convoy ships in line without showing navigation lights. Instead of infra-red, ultraviolet lights were used. On the stern of each ship in line, an arc lamp producing high ultraviolet values was placed, covered with a Corning glass screen, a sheet of black glass which no visible light can penetrate. The watch officers on the bridge of the next ship were equipped with a fluoroscope, such as is used in X-ray work, and with this they could see the signal light plainly, while it remained invisible to the enemy.

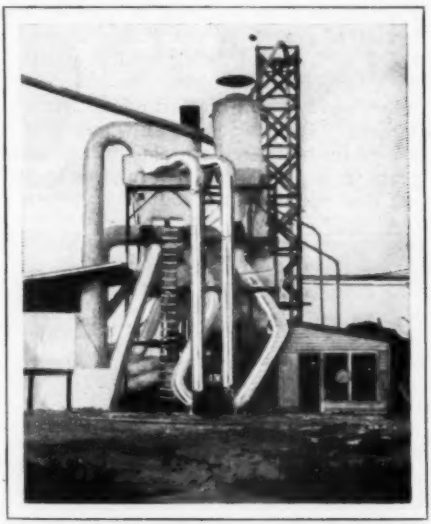
Neither noctovision nor television can see farther than the human eye, but the ability of the former to penetrate atmospheric conditions which balk the eye, gives it its value. In experiments in California, photographs have been taken, through fog and clouds, of sequoia forests more than 200 miles away, and infra-red pictures of Pasadena, taken through the fog from the observatory on a near-by mountain top, are regularly used to check similar infra-red pictures taken of Mars.

OLD THEATERS TRANSFORMED INTO SWIMMING POOLS

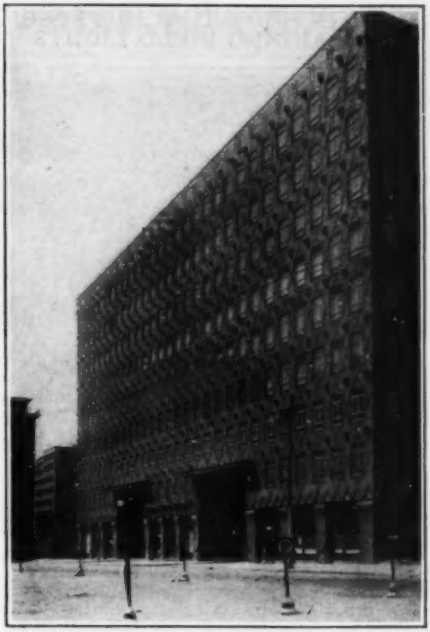
Old theaters, usually difficult to dispose of, are being remodeled into swimming pools in New York. The sloping floors make conversion into pools easy, and the balconies provide space for spectators. Four vacant theaters will be so used.

HAY DRIER REMOVES MOISTURE IN FORTY SECONDS

Acting somewhat on the principle of a corn popper, a giant hay drier shreds and removes the moisture from hay in forty seconds, during which the grass travels through 1,500 feet of pipe and is delivered in bags ready to be hauled to storage. Green hay is fed into the machine, cut into inch lengths and then blown through a series of insulated pipes where it is subjected to a temperature of 700 degrees. The exhaust from two gasoline engines used as power first strikes the hay as it passes through the pipes, after which the curing is completed by steam and various gases of combustion. The hay does not burn or bake because it passes through rapidly, and at the time the highest temperature is reached, there is no oxygen in the chamber to support combustion. In the early stages, the principle of the corn popper is used, for, as the heat increases, a small volume of steam is created in each tiny stem, causing a mild explosion which blows the piece open. Hay comes from the drier somewhat shredded and pulverized, but retains a green color and typical odor. An automatic stoker assures a fairly smokeless exhaust, keeping the hay from becoming sooty.



Hay Drier Works Like a Corn Popper to Remove Moisture from Grass in Forty Seconds



Diagonal Lines and Headlike Designs Give a Facade Effect to This German Business Block

CROSSLINES ON BUILDING GIVE UNIQUE EFFECT

Diagonal lines which form a crisscross design have been used to produce a remarkable appearance by the architects of a mercantile building in Hamburg, Germany. Combined with these lines are projecting headlike designs which give a facade effect rarely carried out in a tall business block.

INDELIBLE COLORED PENCILS LIKE WATER COLORS

Colored indelible pencils now are being produced with a thin lead that will take a sharp point like an ordinary pencil for fine work. The leads, in twelve colors, are stronger and more durable than those in the ordinary colored pencil, and the makers say they will last about three times as long. By going over the fine markings with a moistened brush, wash effects are obtained, the shades blending like water colors. The pencils are used for sketching diagrams, maps and charts. They may also be used to supplement colored inks.

WIND DIRECTION IS INDICATED BY LANDING FIELD LIGHTS

Model of a System of Sunken Ground Lights for Airports Which Also Shows Wind Direction

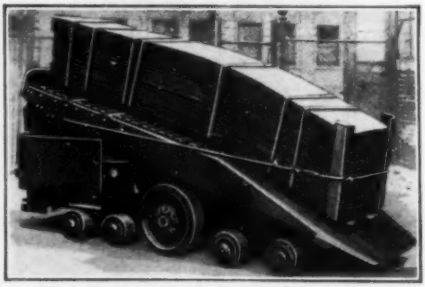
Ground lights on airplane-landing fields may serve the double purpose of indicating the exact center of the field and showing the prevailing wind direction. The arrangement includes a series of eight glass-covered trenches shaped like the spokes of a wheel in the center of the field, which light automatically to show wind direction. They are faced with heavy plate glass capable of sustaining the weight of a plane and are wired separately to a rotary switch driven by a wind vane, the vane switching light to the trench which lies toward the wind. A white and red glass combination on the trench makes it easily seen from the air.

REDUCED SIZE OF BANK NOTES CUTS PRINTING BILL

Uncle Sam expects to save about $1,600,000 a year by using the smaller-size currency which was placed in circulation recently. The new bills will result in a saving of 550 tons of paper, worth $500,000, and 500 tons of ink, valued at $100,000, while reduced labor will save $1,000,000. Plates used for long-run engraving now are made by the electrolytic process, which multiplies the number of plates that can be made from the original engraving, thus lengthening the life of an original plate. The change in size of the money meant only slight changes in the mechanical equipment of the bureau of engraving and printing. Machines for trimming sheets to size were rebuilt, and those used for the final operation of numbering, sealing and separating were replaced with typographic presses which take sheets of twelve subjects each, print two serial numbers and a seal on each note, cut the sheet in half, separate each half into six notes, collate the notes in numerical sequence, and deliver them in units of 150 each. Twelve notes now are cut from one sheet of paper where only eight were obtained before. A new-type press produces 336,000 notes a day.

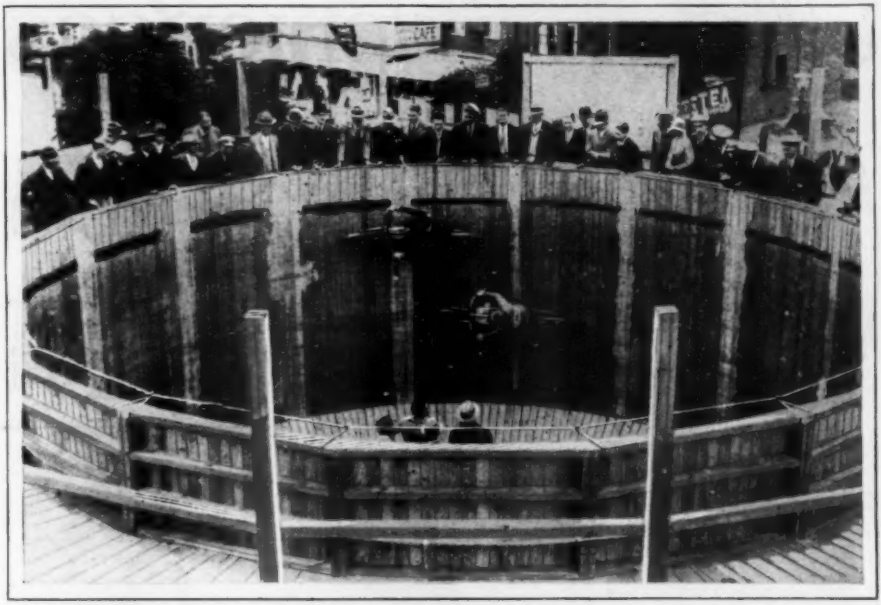
SELF-LOADING TRUCK HANDLES TEN TONS OF STEEL

Ten tons of sheet steel are handled at a time by a self-loading truck with tilting platform on which the bundle of sheets is pulled by a looped cable attached to a motor-driven drum at the front of the truck which is operated by storage batteries. At the lower end, the platform tapers down to the thickness of steel plate, this end resting on the floor when the platform is tilted down for loading. When the bundle is in position, it rests on the center of gravity so the platform can be tilted up by hand, being held in position by a locking mechanism. Rollers on the upper part of the platform facilitate unloading. The truck has ten wheels and is driven by two large wheels through spur gears. It has a short turning radius to permit operation into and out of box cars.



Self-Loading Truck with Tilting Platform Which Handles Ten Tons of Steel at a Time

"WALL OF DEATH" LATEST MOTORCYCLE THRILLER



Motorcycle Riders Assume Almost Horizontal Positions as They Speed around the Vertical Sides of This London Bowl, Which Has Come to Be Known as the "Wall of Death"

Daring motorcycle riders who use the almost vertical sides of a large bowl as a racing track are affording thrills to London's seekers after diversion. The riders are in almost horizontal position as they speed around the perpendicular track, which has come to be known as the "wall of death," because of the danger involved.

ZOO PENGUINS LIVE IN ICE BOX

When eight penguins, accustomed to the antarctic regions, arrived recently at the Philadelphia zoo, officials faced the problem of keeping them cool, because the expensive birds were unable to withstand the temperate climate. The zoological society met the issue by building an ice box for them. The floor of the shelter is a shallow concrete basin on which was erected a house made of heavy planks with a roof of heat-resisting tar paper. A door in the front and a window at the rear for the ice completed the abode. Each day 500 pounds of ice, cut in layers, is spread on the floor and the birds sleep standing up on the ice-covered concrete. Native shrubs and greens surround the house and outside is a lake where the birds disport themselves.

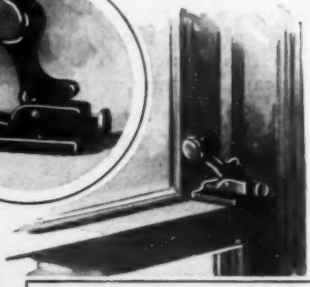
CIGAR EXTINGUISHER COMBINED WITH ASH RECEIVER

For the careful smoker, who avoids fire hazards, a combined cigar extinguisher and ash receiver is on the market. The extinguisher unit is operated by pressure of the finger which brings water into a recess at the top, the heat from cigar, cigaret or pipe drawing the water to the glowing ash. After extinguishing the fire, the water flows back into the container, which will not leak even if held upside down. The ash receiver is carried on a tray as a separate unit. The appliance is made for attachment to automobiles and can also be fastened to the clothing of hikers.

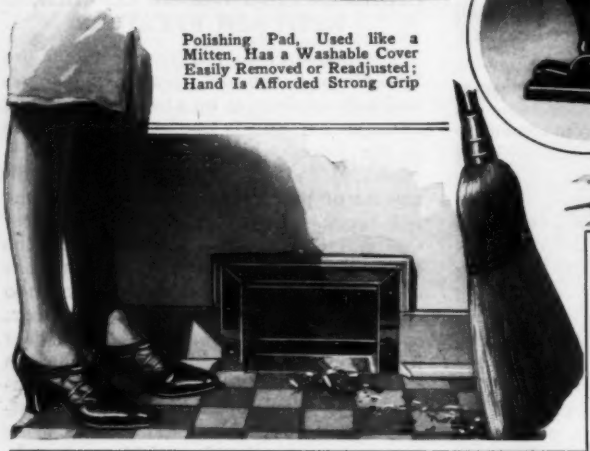
New Conveniences

Gripper Serves as Extra Fingers; It Does Scores of Tasks Such as Reaching inside Bottles, Taking Things from Fire and Dusting Difficult Places

With These Rubber Protectors, the Wearer Can Place Arms in Water Almost Up to Elbows without Wetting the Sleeves; They Are Decorated to Match Apron and Have Tight-Fitting Wristbands



Polishing Pad, Used like a Mitten, Has a Washable Cover Easily Removed or Readjusted; Hand Is Afforded Strong Grip



Above Is an Easily Attached Window Lock That Firmly Secures Both Sashes and May Be Employed to Hold Doors Open or to Lock Them; at Left, a Built-In Dust Bin That Takes the Sweepings for Later Removal or Deposits Them through a Chute into the Basement; It Is Furnished in Nickel or Colors to Match the Woodwork

for Your Home

Double-Sponge Scrub Brush Saves Handling Dirty Water; the One on Base Does the Drying and the Bulky One Absorbs the Water; It Is Cleaned by Holding It under Faucet

Here Is an Improved Casement Window with a Screen That Fits Flat against the Frame and Is Easily and Quickly Removed from the Inside; Window Is Readily Opened by Handle That Extends through the Screen

Chemically Treated Rubber Sponge Keeps the Hat Clean and Is Also Useful in Removing Spots from Lamp Shades and Fabrics; It Is Washed with Soap and Water

Sanitary and Well-Ventilated Cooling Cabinet for Food Fits on Window Ledge to Save Space; Shutter Vents Close When Door Is Opened, to Keep Cold Out of Room

Modeling Tiny Heads in Colored Clay to Demonstrate Character Make-Up in Movie Studios

MOVIE MAKE-UP IS TRIED OUT ON MODELED FACES

Tiny heads modeled in colored clay are used in the moving-picture studios to work out and demonstrate character make-up. Three or four-inch heads are made of Indian chiefs, prize fighters or Arabian sheiks and submitted to the director who suggests any changes desired, after which every detail of make-up is worked out on the models. The actor then is made up to resemble the clay image and a screen test is made. The method gives a view of the head from all angles, enabling visualization of the actor in make-up, thus saving time and money.

GAS IS STUBBORN PRISONER ABOARD AIRSHIPS

Roast beef is a close relative of the largest airships in use today, the "Los Angeles," "Graf Zeppelin" and the new British air liners. Hydrogen or helium gas that provides lifting power for the air giants is contained, not in a single compartment within the rigid hull, but in a series of gas cells. These drum-shaped containers have nothing to do but retain the precious lifting gas. The job of warding off rain, hail, sunlight and wind is left to the outer covering of aluminum-coated balloon cloth. Lives of airship builders have been made less tranquil by the fact that hydrogen and helium gases are more difficult to keep in captivity than the most ferocious circus animals. No matter what kind of material is used for the gas cells, there always is a constant oozing of the contents into the outer air. One of the most satisfactory materials for keeping the gas captive is goldbeater's skin. This extremely tough substance forms the outer covering of a portion of a steer's intestinal system. Hence the close relation of roast beef and airships. Goldbeater's skin, as the name implies, is used in beating gold—hammering it into sheets so thin that light will pass through. With its toughness is combined the ability to retain gas better than almost any other material. As it comes from the packing company, a barrel of salted skins contains 2,500 pieces. Gas cells are manufactured from the skins cemented to a cloth base. One method makes use of glue to hold the pieces in place. An improved system consists of laying the skins on rubberized balloon cloth coated with rubber cement, the pieces overlapping about one and a half inches. An idea of the number of steers represented in a dirigible is given by an order for the ill-fated "Shenandoah," totaling 1,500,000 skins.

HUB PLATES FOR AUTOMOBILE ADD TO ITS BEAUTY

Hub plates for Ford cars now are on the market as an accessory to add to the car's appearance. The plates are chromium-plated, fitting around the original hub cap which does not need to be removed to install them. Once in place, they do not jar loose or interfere with removal of the wheel.

MOVIE WIND MACHINE SNUFFS OUT OIL FIRES

Above, Wind Machine Extinguishing Oil-Well Fire, and, at Right, Aerial View of the Blaze

Hollywood's movie industry contributed the latest development for the conquering of burning producing wells, when a wind machine, such as used in moving pictures to create windstorm effects, extinguished a burning gasser in the Santa Fe Springs field. Two wells broke out as uncontrollable producers and a day later developed into that terror of town-lot fields—burning gushers. With blazing oil spouting 200 feet into the air, neighboring wells, tanks, sump holes, warehouses and offices soon fell a prey to the flames, and before the spreading fire was even partly controlled, a damage of approximately $4,000,000 had been caused. The original two wells burned as flaming torches for more than a week. The usual methods employed to "kill" the flames failed and, as a last desperate method, a committee of

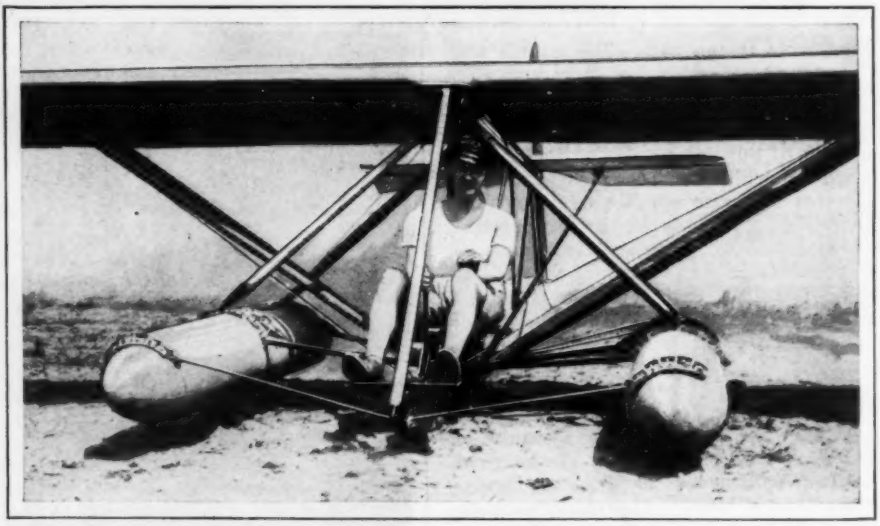
operators decided to borrow a wind machine from one of the motion-picture companies, in an effort to enable their men to approach closer to the well to make necessary observations. When the machine arrived at the field, a test revealed its wind-producing strength to be so powerful that it was decided to attempt to blow out the well with it as a man blows out a candle with his breath. A crew of eighty workers was selected to make the experiment. They were garbed in asbestos coats and trousers, and carried shields before them as protection against the heat. Then the wind machine was turned on, full blast, toward the burning geyser. To the joy of the oil operators, the machine blew the column of fire to one side sufficiently to enable the crew to "hook" a flow line to one pipe of the well. With the flow of the well diminished by half, the machine was next directed at the twelve-inch casing from which the fire and oil roared forth. At the third attempt, when the machine was turned on full force, the blaze suddenly died out. The wind machine is a truck-like affair, carried on rubber-tired wheels. A housing contains a powerful electric motor which operates a series of four airplane propellers which produce the wind.

WASTE FROM AUTOS FILTERED FOR OIL BURNER

Oil burners have been designed to use waste oil from the drainage of cars. The equipment includes a filter to strain dirt and water from the waste, and the burners are used in both heating and cooking stoves. The heater is intended particularly for economical use in garages and workshops where such fuel is plentiful, but heavy oils, such as those remaining after the extraction of gasoline or kerosene, also may be used in homes. A settle filter is operated on the principle that the oil rises to the top while water and sediment sink, the oil being drawn off through gauze. A small air pump is used to clean the gauze at intervals.

GLIDER FITTED WITH PONTOONS TO LAND ON WATER

German gliders long have flown successfully over land, but have been at a disadvantage when air currents forced them over open water and then made a landing necessary. Now, one of the wind craft has been fitted with pontoons resembling those attached to amphibian planes, making a water landing easy.



Here Is a German Glider Fitted with Pontoons, Like an Amphibian Plane, So It Can Make a Successful Water Landing When Air Currents Carry the Craft to Sea

Making Crown Jewels *for the* Movies

Petersen-Fagerstam with Completed Replicas of Crown Jewels of the Russian Czars; He Is Holding the Czarina's Tiara, and, at the Extreme Right, Is a Bracelet of Sapphires from Persian Crown Jewels

IN THE last five years the motion pictures have used more than half a billion dollars' worth of crown jewels, famous gem sets and historic ornaments worn by their stars, stolen by their crooks, and missed in their mystery plays. This year approximately $200,000,000 worth will appear on the screen. That is to say, they would be worth that if they were real.

Yet they are such perfect imitations that, under the glowing lights of the studios, worn by a daughter of Pharaoh, a queen of Babylon, a Czarina, an empress of India, or a modern social leader, all show, in the film, exactly the design, size, color and appearance of the jewels of the women they represent at the period presented in the play.

Up to five years ago, the motion pictures used whatever jewelry the costumer could supply. Then the public and the critics arose, demanding accuracy in gems as well as in costumes and customs. They never hoped to see the Kohinoor, the Orloff diamonds, Persia's royal sapphires, Hyderabad's pigeon-blood rubies, Naishapur's emeralds, or the priceless pearls of the crown of Holland, but they did want to see them reproduced accurately whenever called for in the film scenes.

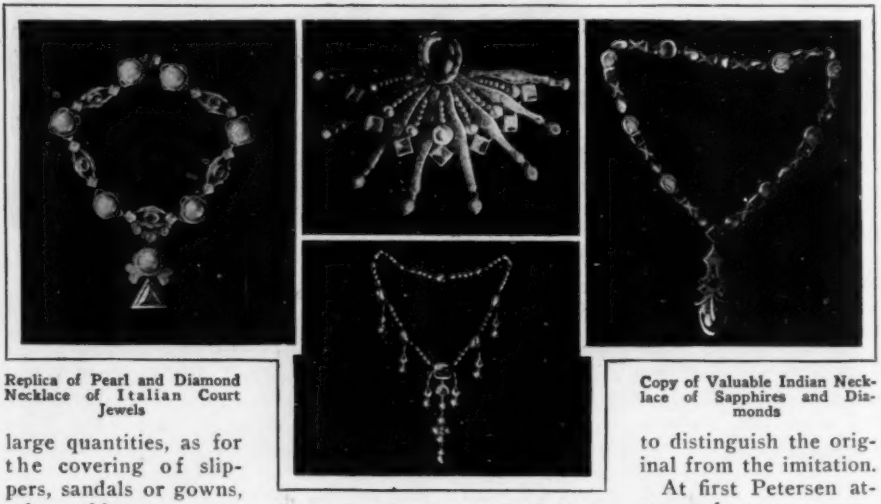
Simultaneously with this demand, there appeared in Hollywood a slender Dane, who had walked through all the capitals of Europe, studying the designing of jewelry, viewing the world's famous gems, and learning to make what we now know as "period jewelry." His name is Willy Petersen-Fagerstam, and he is descended from generations of jewelers in the Danish capital. From white and colored glass he fashions gems of all kinds; from copper, pewter, German silver and brass, he works the platinum, gold and silver mountings, and from glass, blown thin as a sheet of goldleaf, he forms pearls, covered with fishscale composition of all the shades of the sea treasures of Ceylon and

the South Seas. In the last year these replicas of famous stones and their settings cost the motion-picture companies more than $20,000. This year, the total invested will be nearly twice as much. What time Petersen is not making gems and jewel settings, he is studying designs and imitations preserved in libraries and museums. In this work, he cannot originate; he must imitate. From the necklace of sabertooth-tiger teeth for the Stone-Age medicine man down to the Hope diamond or other famous stones and their settings of today, Petersen makes them all exact replicas of the individual productions of ancient and modern jewelers, and gold and silversmiths.

He uses glass, and glass only, to produce replicas of the famous, and common, jewels of the world. Virtually all of it, cast and ground with the proper "faceting," comes from Czechoslovakia, Prague being the largest source. These countries produce a cast glass, uniform in coloring, with a very high factor of reflection, such as can be had nowhere else in the world. This cast glass is used for diamonds, except when wanted in large quantities, as for the covering of slippers, sandals or gowns, when rhinestones are called in; for emeralds, rubies, sapphires, topazes, amethysts, lapis-lazuli, zircons, Alexandrites, indeed for every "solid" stone. No paste or other composition stone is ever used. These "casts" are made in duplication of the originals, from exact measurements and color photographs. They mimic not only the size, shape and color of the famous gems of the world, but reproduce every flaw possessed by the originals—and no great gem exists without faults of some kind. Once cast, the imitation gems are ground by hand. There is no wholesale production of these stones. Almost as much attention is given to each as the cutters of Amsterdam give to the genuine stones.

Pearls for the motion pictures—from the great pear-shaped pink pendants in the crown jewels of Holland, England and some of the Indian states, to the smaller but more uniform treasures of modern necklaces—are blown in the thinnest of glass by the workers of central Europe. Every famous and valuable pearl in the world has been so imitated as to size, shape and color, in blown glass. When the "pearl" has cooled, it is covered with several coats of a varnish made from fishscales, and colored to the exact tint of the original. Laid side by side, except for weight, it would be extremely difficult to distinguish the original from the imitation.

At first Petersen attempted to use synthetic and culture pearls, but these did not photograph so well, cost more, and, once broken, could not be replaced immediately. Moreover,



Replica of Pearl and Diamond Necklace of Italian Court Jewels

Replica Tiara from Austrian Jewels Above and Pearl Necklace from Holland

Copy of Valuable Indian Necklace of Sapphires and Diamonds

Photos Courtesy Paramount Pictures

Making a Jeweled Slipper for Period Costume of the Time of Louis XIV; on the Bench Are Exact Imitations of Royal Russian and Austrian Headdresses

they could not be obtained in the shapes, sizes and colors to duplicate the originals. In these pearls, liquid glass of a shade of pink, gray, cream, ivory or black, exactly the same as that of the particular gem to be imitated, is used in the blowing. Then the fishscale composition is tinted to the same degree and applied. The result, to one who is not an expert on these treasures of the sea, is the same as the original.

In plain, unlocked wooden drawers Petersen keeps thousands of these imitation jewels. There one sees the Orloff diamonds, the Kohinoor of Shah Jehan, the great sapphires of Persia's royal regalia, the empress of India "set" of diamonds, replicas of the world's most notorious necklace, that of the diamonds which involved Louis XVI, Marie Antoinette, Cardinal Rohan and other dignitaries of France in a historic fraud. There are reproductions of the Great Mogul, the Regent, the Nizam of Hyderabad, the particular yellow Orloff, said to have been the looted eye of an East Indian idol; the Great Table of Persia, once the property of Genghis Kahn, one of the few rectangular diamonds, the Duke of Westminster's Nassak; the famous bearer of bad luck, the blue-tinted forty-five-carat Hope diamond, probably part of a mysteriously missing 112-carat colored stone, brought to Europe by Tavernier and later stolen from the French crown jewels.

The large stones, like the Cullinan, Tiffany, De Beers and others, though never worn, must be on hand for museum scenes, jewel-robbery stories, and royal scenes in which such huge gems might be on display. Similarly, Petersen keeps in his workshop a collection of artificially made matrix containing excellent imitations of the various precious stones, for use in pictures whose scenes are laid in the remote parts of Africa, India, or other gem-producing countries.

Petersen's tools are of the simplest, and any maker of real crown jewels would laugh at his little workbench and its equipment. Several pliers, with round, square and flat noses, and four or five hammers of varying weights and faces, will make any kind of jewelry of any period, when they are helped out by a small vise with corduroy pads on the jaws and some colorless cement.

Above, Disappearing Hose Reel Which Fits in Coal-Chute Door; Below, the Door When Closed

DISAPPEARING HOSE REEL FITS ON COAL-CHUTE DOOR

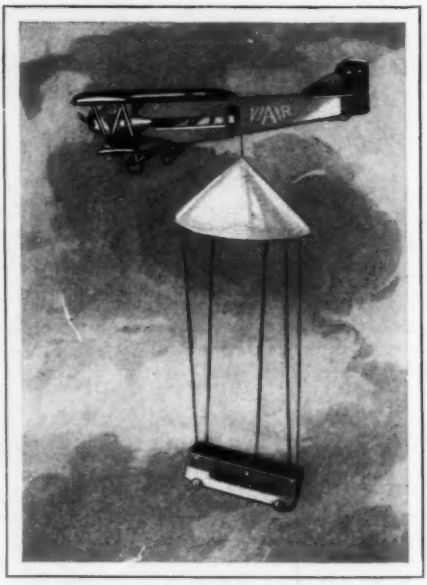
Caring for the garden hose has been simplified by combining a hose reel and coal-chute door, the reel being mounted on the door, which opens at the top, allowing it to rest on the ground. The reel is made of heavy steel and operates on ball bearings, while the frame is formed by the flange of the coal chute. When the winding reel is removed the chute is unobstructed. The end of the hose connecting with the faucet is fastened to a projecting pin so it may be hooked up without unwinding the length of hose, or a connection from inside the basement may be made. The hose also may be used in the basement for washing the floor or for wetting down the coal pile.

COTTON SEED "FUZZ" VALUABLE

Cotton manufacturers are finding a valuable by-product in the heretofore useless "fuzz" that remains on the cotton seed after the fiber has been removed. Chemists have found that this fuzz can be made into a fabric resembling silk and now the seed is shaved very close to obtain the product, which is used for making automobile tops, as a leather substitute, and for combs, brushes, mirrors, films, sausage casings, paper and collodion.

DETACHABLE AIRPLANE CABIN FOR SAFETY AND PRIVACY

Models of a detachable cabin for airplanes have been made by an inventor to add to the safety, privacy and comfort of future air travel. The detachable compartment has a parachute on top so that in case of danger, the pilot may release the compartment containing his passengers, the cabin dropping through the fuselage and floating to earth beneath the parachute. The cabins have wheels like auto trailers, and a person traveling much by air might own such a cabin, keeping it in his garage. When going on a trip the cabin would be hauled to the airport as a trailer, there attached to the airplane, and, if necessary, detached and fastened to another airplane at a transfer point, then hauled to the passenger's hotel door at his destination. The cabins also might be used in handling mail and freight without packing and unpacking.



Detachable Airplane Cabin Which Floats to Earth by a Parachute When Loosed from Plane

MODEL LOCOMOTIVE HAULS SIXTEEN PERSONS

A Model Locomotive, Built on a Scale of Three-Fourths of an Inch to a Foot, Pulls Sixteen Persons on a Real Railroad Track, and Has Made a Continuous Run of Nine Hours

Built on a scale of three-fourths of an inch to one foot, a one-sixteenth-size model of an Atlantic-type locomotive has been made by a mechanic as a toy for his children. The locomotive, complete in every detail and operating on a real railroad track, has pulled sixteen persons in addition to the engineer and has made a continuous run of nine hours. It won a medal, a cup and a diploma of merit at a British model-engineering exhibition. Leisure time of two years was spent by the maker in its construction.

WEATHER BUREAU ON WHEELS BATTLES FOREST FIRES

California forest fires are being fought by a portable weather bureau mounted on an automobile truck. The weather bureau on wheels is equipped with a radio-receiving set, apparatus for establishing three emergency weather stations, and complete charting equipment, a radio operator and weather observer composing the crew. The outfit is rushed to the scene of a forest fire, where the radio picks up weather conditions and forecasts, adding to this local observations including wind conditions. Charting this information, the observer makes a forecast for the fire area which is rushed to the fire fighters, who are thus enabled to concentrate their efforts at strategic points of the fire zone.

BLIND TAUGHT MATHEMATICS BY TOUCH SYSTEM

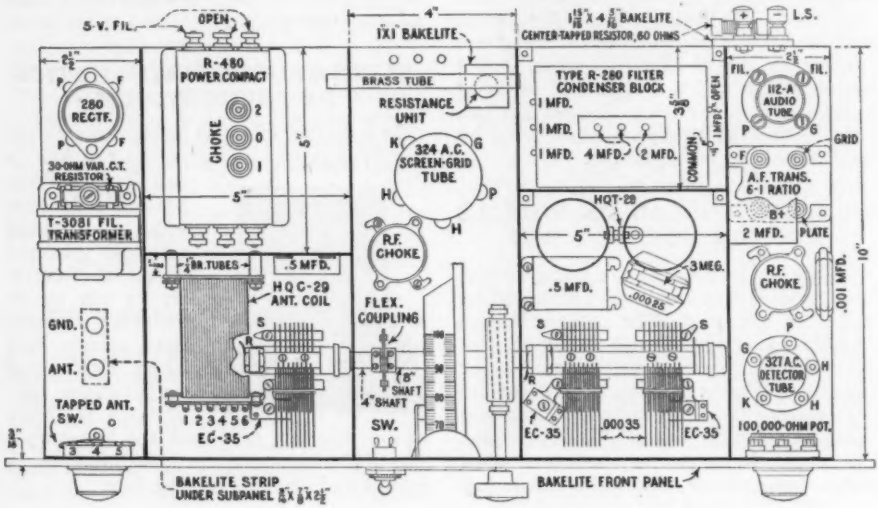
In a further effort to help overcome the handicap suffered by the blind, the American Braille Press has evolved a system of teaching sightless persons simple mathematics by the touch system. Heretofore efforts had been centered mainly on improved methods of dot printing, read with the finger tips. The mathematics system substitutes raised figures and symbols for the dots.

Self-Contained Volume

THIS completely shielded a.c. screen-grid receiver employs a band-pass filter in a highly efficient three-tube circuit. Designed and built in Popular Mechanics radio laboratory and thoroughly tested in a locality where selectivity is an absolute necessity, this receiver easily separated strong locals. The volume and tone are remarkably good; in fact, the volume is equal to that of a six-tube receiver employing standard type 201-A tubes. This is, of course, due to the greater amplification and careful handling of the a.c. screen-grid tube.

Selectivity is possible only through the use of the band-pass filter and careful shielding, and is practically that obtained by the use of three r.f. stages employing the usual tuned r.f. circuit.

The all-metal cabinet for the set and power supply is the one described in detail in the September issue of Popular Mechanics, and the only alteration necessary is to provide a slightly deeper compartment to the right of the dial for the band-pass filter. The layout diagram shows the shielding and location of all the instruments with the exception of the three



A-C-Three has Tone

by Frank L. Brittin

biasing resistors and two by-pass condensers, located for convenience below the metal subpanel. These instruments are shown in dotted lines in the wiring diagram on page 650. The resistors and by-pass condensers could just as well be placed above the subpanel, which would avoid the necessity of raising the ½-in. subpanel to ¾ in. to accommodate them. Therefore, the front-panel template is laid out for a ½-in. subpanel; a bakelite panel, 3/16 by 7 by 21 in., will fit nicely in a standard 21-in. wood cabinet, which must be 12 in. deep, to house the entire receiver. If a ¾-in. subpanel is used, either cut ¼ in. off the partitions at the top or use a bakelite front panel, 7¼ in. wide instead of 7 in., and leave the partitions as they are. It will, of course, be necessary also to raise the holes in the panel ¼ in. higher than shown on the template.

Mount the instruments as shown in the layout diagram, and use soldering lugs for all possible connections. Keep the coils at least ½ in. from the metal partitions. The holes for the antenna and ground posts are drilled large enough to drop the two Eby binding posts through the subpanel, where they are mounted on the bakelite strip and held to the underside of the subpanel with short machine screws. The large fixed-resistance unit is mounted upright on a small piece of bakelite at the rear, by means of a rod threaded at each end for 6-32 nuts.

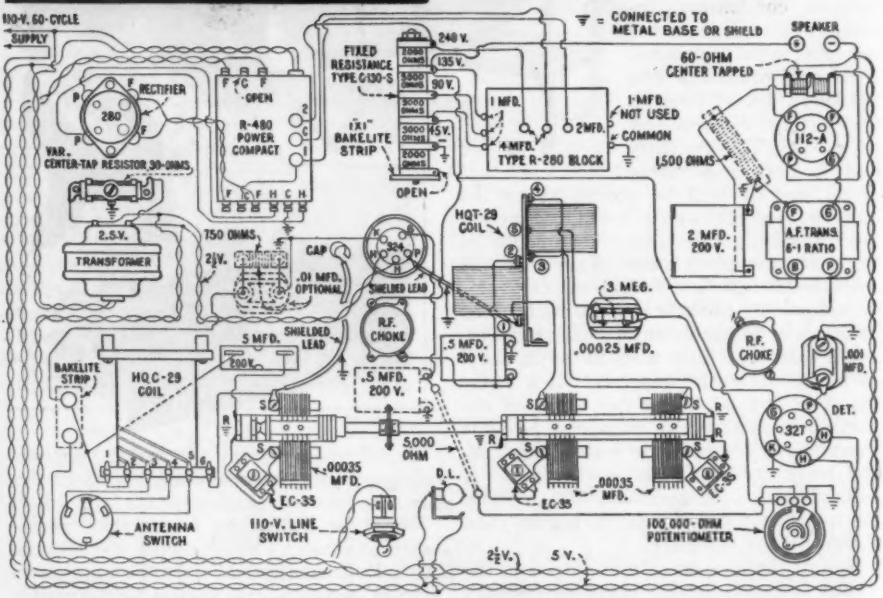
The rotors of the variable condensers are all grounded to the metal subpanel through the condenser frames. The holes in the center partitions for the shaft should be drilled no larger than necessary to clear. The balancing condensers, E-C-35, are mounted before the condensers are in position and should be accessible for adjustment.

The original metal-cabinet front panel is drilled by using the bakelite panel as a template. An opening is cut in the metal panel for the rear of the escutcheon plate and lamp bracket, and for the antenna switch, a.c. line switch and potentiometer. The indicator-drum bracket is mounted directly on the metal panel and held in position with two screws through both panels.

Bolt the front panels together temporarily and mount the instruments. Line

screws on the subpanel in order to line up the condensers correctly. When in position, loosen all setscrews and remove the condenser shafts and front panels. It is best to wire as much of the set as possible with the end partitions and front panels off.

Use nothing but well-insulated standard hookup wire designed for a.c. receivers; the leads from the power compact should have 1/32-in. rubber insulation, especially where they run through the metal tubing from the compact to the filter-condenser block and to the resistance unit at the rear. The same kind of wire is used for the lead to the switch on the front panel, and a smaller a.c. twisted-type for the 2½



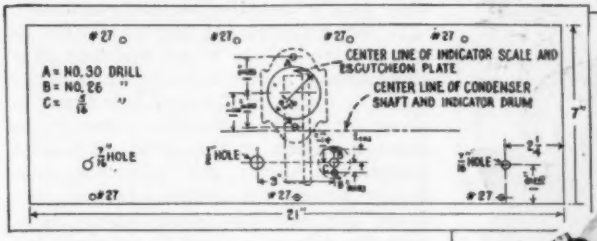
Upper Left, Underside View of the Completed Receiver Showing the Location of the Biasing Resistors and By-Pass Condensers; Below, Simplified Wiring Diagram Showing the Various Instruments in Approximately the Same Positions They Occupy in the Assembled Set

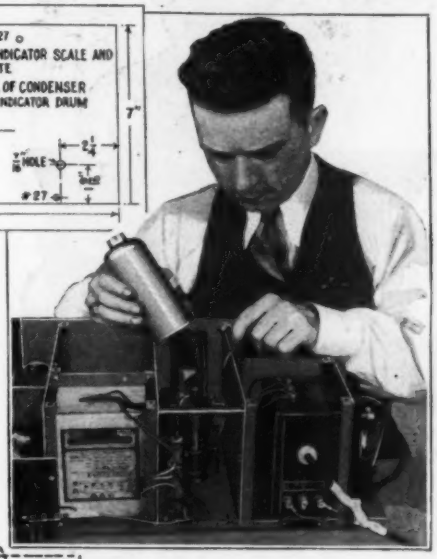
up the variable condensers, shafts and dial through the indicator drum. To insert the shafts, remove the two end partitions. Mount the flexible coupling as shown and tighten the setscrews in the coupling, condensers and indicator drum. The knob on the indicator drum should now turn all the condensers freely. It may be necessary to loosen and slightly shift some of the condenser-mounting

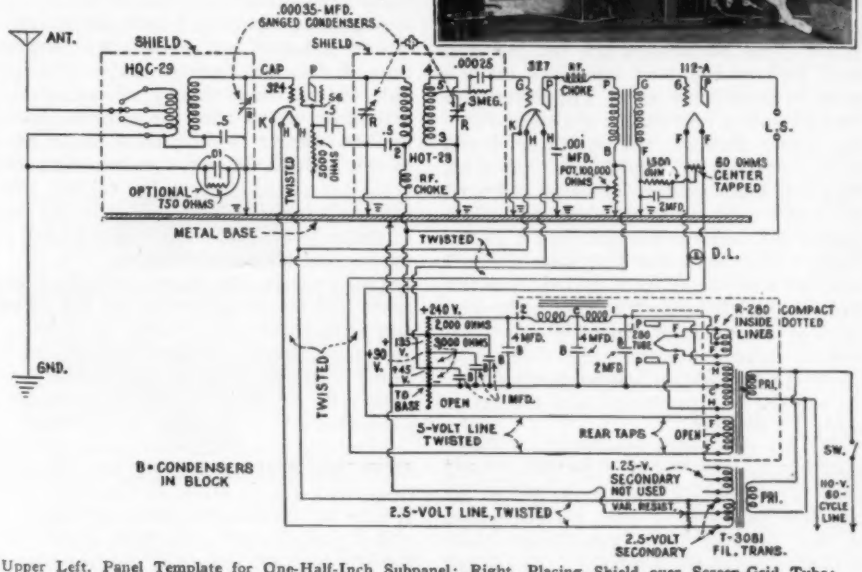
and 5-volt filament leads. The metal base and shielded compartments form a common ground, eliminating long leads. Note that the control-grid lead and plate lead from the screen-grid tube are shielded by means of insulated wire covered with a woven-metal sheath. These shields are grounded where they come in contact with the metal cabinet. Care should be taken that the metal sheath does not touch

the terminals at either end. The filament transformer has a 2½-volt secondary winding for the screen-grid tube and detector.

The variable center-tapped resistor across the 2½-volt secondary is mounted with stiff busbar wire, above the transformer, in an easily accessible position for adjustment to prevent hum. The center lug is connected to a short lead and grounded on the metal partition. The other center-tapped resistor across the 5-volt filament line, near the audio tube, is mounted on a small bakelite panel which also carries the speaker posts. The center post of this resistor is taken to the 1,500-ohm resistor under the subpanel, and the other end of the 1,500-ohm resistor is screwed directly to the metal subpanel. The opposite end must not touch the metal. The 2-mfd. by-pass condenser across this resistor is mounted on the partition above the a.f. transformer. The .01-mfd. fixed condenser and 750-ohm resistor, indicated with dotted lines under the subpanel and marked optional, is really necessary for the correct operation of the set. The leads 3, 4 and 5, from the antenna coil, run through holes drilled in


#27
A = NO. 30 DRILL
B = NO. 26 "
C = 5/16 "
CENTER LINE OF INDICATOR SCALE AND ESCUTCHEON PLATE
CENTER LINE OF CONDENSER SHAFT AND INDICATOR DRUM
7"
21"





Upper Left, Panel Template for One-Half-Inch Subpanel; Right, Placing Shield over Screen-Grid Tube; Below, Schematic Diagram of Three-Tube A.C. Screen-Grid Receiver and Power Supply

the end partition and go to the taps on the antenna switch.

With the end partitions removed and the front panels in position, insert the

Above, the Completed A.C. Screen-Grid Receiver Ready for Testing

shafts in the variable condensers, and replace the coupling. See that the rotors of the three condensers are "all in," and then tighten the two setscrews on the shaft in each rotor unit. The rotors are now all in one unit on the shaft and turning freely through the indicator drum. Lift the rotors to the "all-out" position, turn the knob on the indicator drum to the left as far as it will go and then tighten the setscrews which hold it to the shaft. Now turn the dial on the shaft until zero shows at front and tighten the setscrew which holds it to the shaft. The knob of the indicator drum will now control all three condensers and drum dial. Complete the wiring to the front panel, replace the end partitions, and the set is ready for testing

Go over the wiring carefully and check each connection. See that every lead that goes through a hole in the metal subpanel or partition, with the exception of the shielded leads previously mentioned, is carefully insulated. The holes should be large enough to pass all insulated leads without touching, if possible. Insert the tubes, connect the antenna, ground and speaker, and plug the supply lead to the transformers into a convenient 110-volt, 60-cycle lighting socket. A single wire, 100 ft. long, will provide a very efficient antenna. Turn on the a.c. switch on the front panel and check the various B-voltages on the upright resistance unit with a B-eliminator voltmeter.

If the voltages are approximately as specified and there is no evidence of a short circuit, slowly turn the knob of the indicator drum until a station is tuned in about the middle of the dial. Now set the antenna switch at the point of loudest reception. Adjust the balancing condenser across the antenna-tuning condenser for the loudest and clearest signal with the volume control at the right full on. This is done with a wooden stick shaped like a screwdriver. Never use a metal tool in the set while the current is on. After adjusting the first balancing condenser, move to the next and balance it also for best possible signal, then serve the last one in the same manner. Once balanced, there is no further need to touch these condensers. A slight adjustment of the potentiometer volume control and the antenna switch may be needed in tuning in some stations to best advantage.

The compact, self-contained construction of this a.c. receiver makes it available for use in a variety of console installations as well as the two suggested methods shown in the photos at the head of this article. However, when the metal chassis is placed in a wooden cabinet, ventilating holes should be drilled in the rear of the cabinet. Do not close the back of the rear metal compartments.

The cost of the parts, including the tubes and metal cabinet, at net list prices will be approximately $65.00. If there are any points that do not seem clear or if additional information is desired, address your letters to Popular Mechanics radio department, 200 E. Ontario St., Chicago.

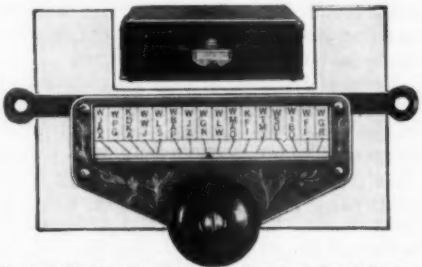
Blueprint No. 144, describing in greater detail the construction of this unusual three-tube a.c. receiver, is now available. It may be obtained for 25 cents, together with a complete list of the parts used. The list of parts will be mailed free to readers who do not desire the blueprint.

Improving the Audio Amplifier

Many experimenters have failed to find any improvement when substituting the new large-type a.f. transformers for the small types in common use. This, however, is not the fault of the new transformers, as they require the use of by-pass condensers and resistors in the circuit to take full advantage of their high-impedance winding and large core. One of the most common difficulties is feedback from the power tube into the grid circuit of the first audio stage. This may be prevented by connecting a resistor varying from 8,000 to 60,000 ohms between the F terminal of the transformer and the C-negative line. For the first audio stage 60,000 ohms is best, and in the power stage employing either the 112-A or 171-A tubes, 25,000 ohms are used. For the type-210 tube, use 15,000 ohms and for the type-245 tube, 10,000 ohms. The type-250 tube works very satisfactorily with 7,500 ohms. A by-pass condenser of 1-mfd. capacity should then be connected from F on the transformer to one side of the filament in all cases.—D. A. Brown, Marion, Ohio.

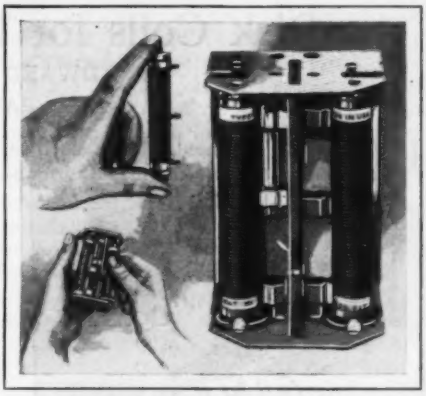
Station Selector Replaces Tuning Knob

A station finder that takes the guesswork out of tuning does not require any changes in the tuning of the radio set nor does it interfere in any way with its regular operation. It is fastened to the front of the set by means of a setscrew on the shaft of the drum dial, or regular tuning dial. Supporting arms fit on the rheostat



Tuning Selector Installed on a Standard Panel Assembly; and Close-Up Showing Call Letters

or other control shafts behind the knobs. A celluloid chart for writing in the call letters of from 16 to 20 stations is located directly above the control knob.



Rectifying Unit Being Placed in the Double Mount; and Complete Rectifier Ready for Installation

New Rectifier for Dynamic Speakers

Operating direct from the a.c. line, a new rectifier for dynamic speakers eliminates the usual power transformer, reducing the cost of assembly. Two units are required for each installation and are supplied either separately or mounted ready to install. The units may be replaced when necessary as easily as a tube is changed in a socket.

Salvaging Charger Bulbs

The writer has found that quite a few charger bulbs are discarded because they are thought to be burned out when such is not the case. Frequently, the base of the tube makes an imperfect contact in the socket and this causes arcking, with the result that in a short while the bulb ceases to function and goes out. The remedy is to scrape the inside of the socket and base of the bulb and sand the prongs bright to insure a good contact, and the bulb will be restored to useful service.—Glenn F. Stillwell, Collinsville, Ill.

Cost of Operating A.C. Sets

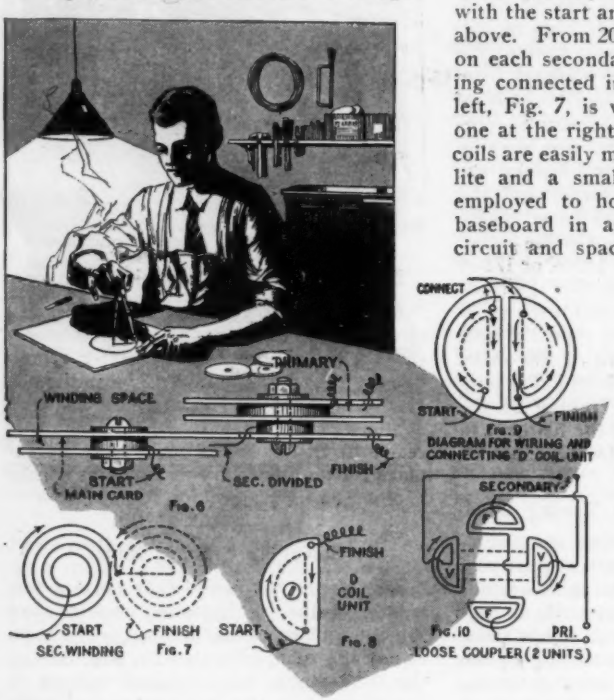
The average a.c. receiver operates at a current cost of but one cent for every three hours of actual use. This is much less than the cost of operating many of the electrical household appliances in common use. The manufacturers of some electric irons estimate the cost of the current consumed to be 3½ cents per hour.

Disk Coils for the Experimenter

By EDWARD A. McMURTRY

PART II

DISK coils of the neutralized-field type, equivalent to the binocular or doughnut varieties, are very efficient. The construction, as shown in Figs. 5, 6 and 7, is quite clear, and the method of winding is very simple. Fig. 5 of the first part of this article, which appeared in the September issue, gives the disk layout for coils of this type. Three disks, 2 in. in diameter, and a fourth piece of cardboard stock, cut on the dotted lines to form the main or center card, are required. The disks are then bolted to the main card with 1/16-in. spacer washers, to provide the winding spaces as in Fig. 6. Note that there are two winding spaces on one side of the main card and one on the other. The two lower spaces are to be occupied by the divided secondary winding, and the separate primary coil is wound in the upper space with the large washer.



The primary coil contains 10 ft. of wire, with the start and finish ends brought out above. From 20 to 25 ft. of wire is wound on each secondary coil, the two coils being connected in series. The coil at the left, Fig. 7, is wound clockwise and the one at the right counterclockwise. These coils are easily mounted on a strip of bakelite and a small metal bracket may be employed to hold them upright on the baseboard in any position required for circuit and space demands.

The wire used should not be of the enameled variety, silk or cotton-covered wire being best for disk coils. If No. 26 wire is used, the coil disks will be somewhat larger than would be required for No. 28 or No. 30 wire. If wire as small as No. 30 is used, cut the wire the proper length and solder special flexible stranded lead wires to each end before winding. Start the winding with the soldered joint just inside the coil form, so that the lead wire only shows on the outside and finish in the same manner. By employing this method the fine wire is protected, as the flexible leads take up the strain and wear.

Coils of the D-type may be closely followed in the modified disk form as shown in Figs. 8, 9 and 10, and very interesting adaptations for variometer and loose-coupler devices are available with the coils rotating in a flat plane. The winding form is shown in Fig. 8 and consists of a disk, 3 in. in diameter, cut in two to provide the sides for the winding form. A smaller piece of cardboard is cut for the winding-core piece, as indicated by the dotted lines. It should be just large enough to provide a ½-in. winding space all around. Glue the core piece in posi-

tion and bolt all three pieces together at the center. This is one-half of the complete unit which is composed of two such coils wound in opposite directions and connected in series.

The single-coil units are then mounted flat on a slightly larger cardboard disk. When two such complete units are put together, the result is a loose coupler or variometer, depending on the manner in which they are connected.

Fig. 10 shows the connections for a loose coupler; if a variometer is desired, the coils should be connected in series, and there will be but two leads instead of four. One set of coils is stationary and the other set forms the rotor. Mount the units facing each other on bakelite strips, one unit stationary and the other so that it may be rotated.

The correct length of wire to be used on a disk-coil unit, the secondary of which is to be tuned with a variable condenser of a given number of plates, such as the unit shown in Fig. 4, in September issue, is best found in the following manner: Wind about 50 ft. of No. 30 wire on the secondary and about 8 ft. on the primary; place the coil in the set and tune in a station operating on the longest available broadcast wave. The station should come in well on the high end of the dial; if this is not the case and the station comes in about the center of the dial, take turns off the secondary and make tests until the station comes in at the high-wavelength end of the dial.

Electrolytic Rectifier Replaces Tube

This simple rectifier differs from the ordinary electrolytic cell in that it employs two aluminum electrodes instead of one. It will replace any rectifying tube or other rectifying element used in conjunction with a mid-tapped transformer secondary. The glass container may be a ½-pt. fruit or salad jar and should be examined carefully to make sure that it is free from cracks. A hole, about 1¾ in. in diameter, is cut in the metal cap, leaving a narrow retainer rim as shown. A hard-rubber or bakelite disk is then cut to fit snugly inside the metal cap, where it is held by the retaining rim. Four holes are drilled in the disk, three for the electrode binding posts and one for a vent. Ordinary wire solder may be used for the lead electrode; the aluminum electrodes are ½ in. wide and 3½ in. long, holes for the binding posts being drilled in one end and these ends bent over ¼ in., to form electrodes 3¼ in. long; the lead electrode is the same length. The electrolyte may be the familiar borax solution made by dissolving as much borax as ½ pt. of distilled water will take up, or a solution of 1 oz. monobasic ammonium phosphate in ½ pt. distilled water. The aluminum electrodes must be carefully sanded and absolutely free from grease or dirt before they are placed in the solution. The connections

Construction Details, and Diagram Showing Connections to Transformer

are plainly shown and must be closely followed. The advantage this type of rectifier has over the tube or cartridge is its low cost; the lead electrode will last indefinitely and the aluminum electrodes are easily replaced when exhausted.—W. G. Fisher, New Haven, Conn.

¶A small wire brush is useful for the purpose of cleaning the tip of a soldering iron before it is tinned.

A De-Luxe Receiver of Unit Design

Probably one of the most elaborate assemblies for home use in the way of a radio receiver is shown in the photo. Seven aluminum cabinet units contain the various components of the set proper. These units, together with a power pack, power amplifier, dynamic speaker and an

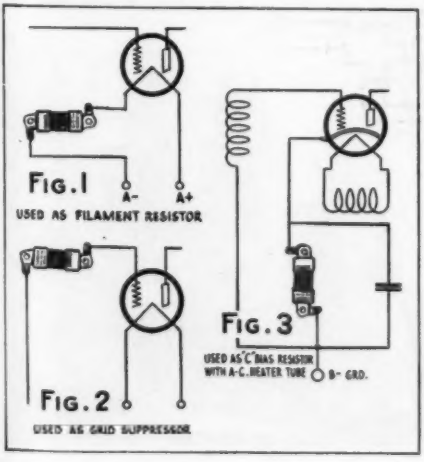
Top, Phonograph Turntable Located in Lower Compartment; Center, Complete Installation; Left, Power Pack and Amplifier

electric-phonograph turntable, have recently been installed in this specially designed console. The circuit employs four stages of tuned screen-grid amplification, detector, two stages of resistance-coupled audio amplification and type-250 power tubes in push-pull. The four screen-grid tubes, the 200-A detector and the two type-240 resistance-coupled tubes are operated on rectified a.c. current, supplied by a 3-amp. 6-volt power plant. The B and C-supply is obtained by means of two type-281 tubes arranged for full-wave rectification. Plug-in coils for the tuning units cover a wavelength range from 200 to 3,000 meters, including the higher

waves employed by European stations as well as those of American and Canadian broadcasting stations. The receiver is not difficult to tune, although each tuning unit is provided with its drum control, and the various units may be coupled together so as to be operated as a single group, thus simplifying tuning. The inclusion of the phonograph feature makes it possible to reproduce records taking full advantage of the audio system.

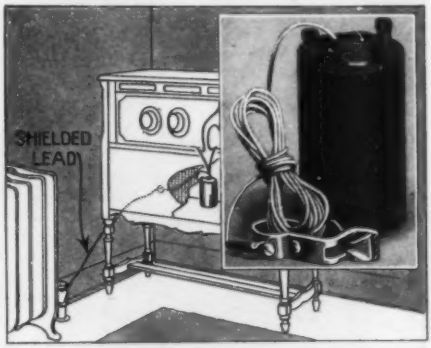
Simple Grid and Filament Control by Fixed Resistors

Inexpensive fixed resistors may be used for grid and filament controls with the standard vacuum tubes in common use. If a fairly steady source of filament current is available, the filament of the tube may be protected by a resistor of suitable resistance for the tube, used as shown in Fig. 1. As a means of stabilizing an r.f. tube with the least trouble and expense, the grid suppressor method in Fig. 2 leaves little to be desired. An inexpensive strip resistor, having a value of from 300 to 800 ohms, may be used for this purpose, as the exact value is not critical. Grid-biasing the heater-type a.c. tube is easily done by inserting a strip resistor in the negative-B lead as in Fig. 3. This method depends on the voltage drop across the resistor for the biasing effect and a by-pass condenser of either .5 or 1 mfd. is employed as shown



New Device Eliminates Antenna

The device shown in the photo is said to give results equal or superior to those obtainable from a good outdoor antenna



Antenna Eliminator, Showing Shielded Ground Lead and Clamp; Left, Sketch Showing Installation

through the employment of a new pick-up principle. It consists of an insulated cylindrical shell, 3 in. in diameter and 5 in. high, containing an inductance and capacity unit. This unit consists of a single-element shielded vacuum tube, arranged in electromagnetic relation to a solenoid coil, the inductance of which is variable in order to adapt it to any receiver, for better selectivity and reduced local interference. It is claimed that the r.f. signal delivered to the receiver from the vacuum tube is both filtered and amplified by its action. The device is self-contained and may be installed in the back of the radio cabinet or console. Antenna and ground binding posts are provided and these are connected to the corresponding binding posts on the receiver. A shielded ground lead is provided with a clamp which is connected to a radiator, water-pipe or other ground. When installation is made, a station is tuned in at the set and the knob on the unit is turned until maximum volume is obtained, after which no further adjustment or attention is required.

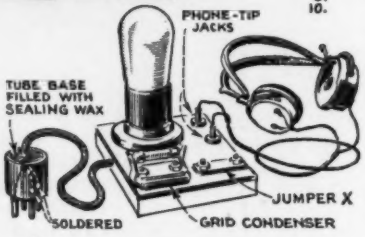
¶Popular Mechanics' radio department offers its information service free to all readers of our magazine. We will be glad to help you with your radio problems and will promptly answer all inquiries.

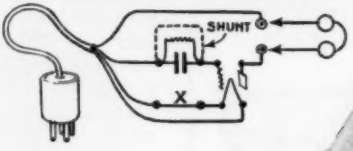
Helpful Radio

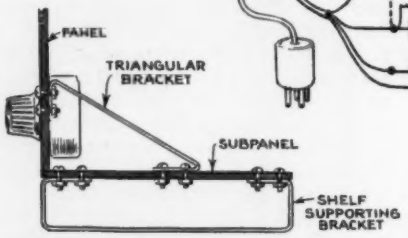
FULL SCALE DEFLECTION OF METER	A 1,000 OHMS	B 10,000 OHMS	C 100,000 OHMS
1. MA.	1. V.	10 V.	100 V.
1.5	1.5	15	150
2.	2.	20	200
3.	3.	30	300
5.	5.	50	500
8.	8.	80	
10.	10.	100	

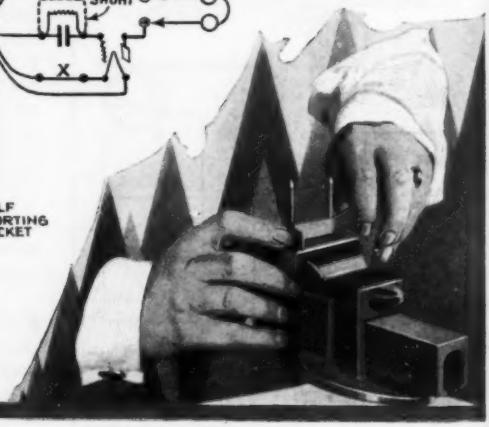
Above, Diagram and Chart for Using a Milliammeter as a Voltmeter by Means of Suitable Resistors in Series; a Milliammeter with Full-Scale Deflection Is Best for Testing B-Power Voltages, as the Resistance Is 1,000 Ohms per Volt; Others May Be Used for General Voltage Testing; Left, Above, Meter and Resistance Units Arranged on a Small Wooden Base

Right, a Simple Trouble Shooter for Multitube Receivers; Start at Antenna-Stage Socket in Set and Transfer Tube to Tester, Insert Plug and Tune Set for Signals; If Signals Are Heard in the Phones, Move Tester to Succeeding Stages Until Dead Stage Is Located; When Plugged into Audio Stage, Shunt Out Grid Condenser; Jumper Is Removed for Ammeter to Read Filament Current of Tube



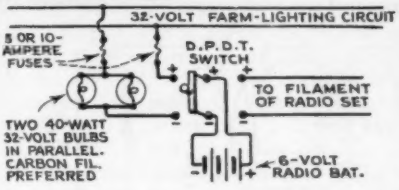




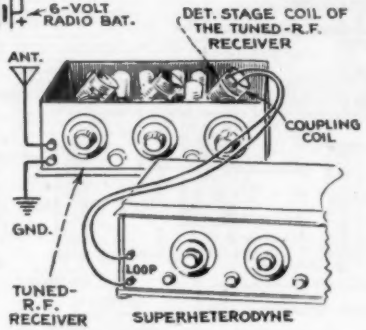


Easily Made Angles and Brackets for the Homemade Receiver; Brass Strip 1-16 by ½ In., Is Suitable for the Triangular Brackets, and ⅛ by ½-In. Strip Is Best for Shelf-Supporting Brackets, Which Must Carry More or Less Weight; Right, Bending the Brass Strip around Large Nails Clamped in a Vise Insures Angles of the Same Height

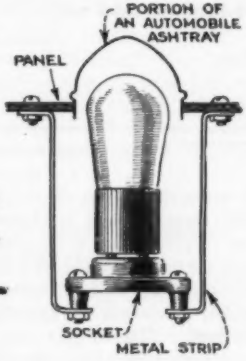
Hints from the Lab.

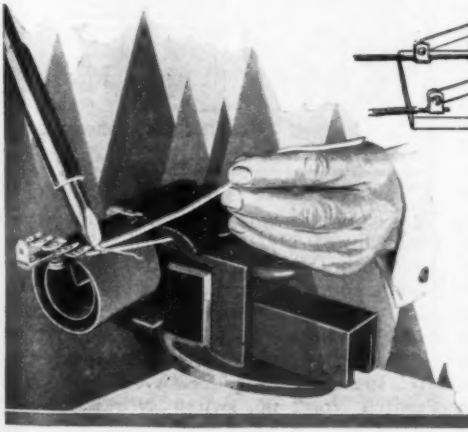

32-VOLT FARM-LIGHTING CIRCUIT
5 OR 10-AMPERE FUSES
D.P.D.T. SWITCH
TO FILAMENT OF RADIO SET
TWO 40-WATT 32-VOLT BULBS IN PARALLEL. CARBON FIL. PREFERRED
6-VOLT RADIO BAT.

Above, a Simple Method of Charging Radio Battery from Farm-Lighting Circuit; the Fuses Protect the Main-Line Fuses; for a Light Charge Remove One 40-Watt Lamp; Right, Additional R.F. Amplification for a Superheterodyne from a Tuned R.F. Receiver Connected to Antenna and Ground; a 60-Turn Coil, Connected to the Loop Posts, Is Inductively Coupled to the Detector-Stage Coil



Above, When Drilling Radio Panels, Place a Piece of Soft Wood of the Same Width under the Panel, and Always Drill Panels from Front to Back to Insure a Clean-Cut Hole at the Front



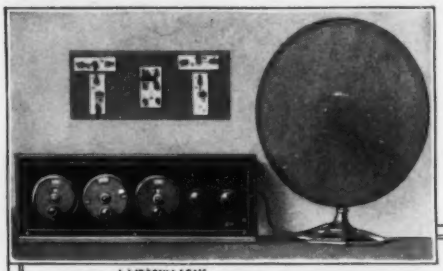


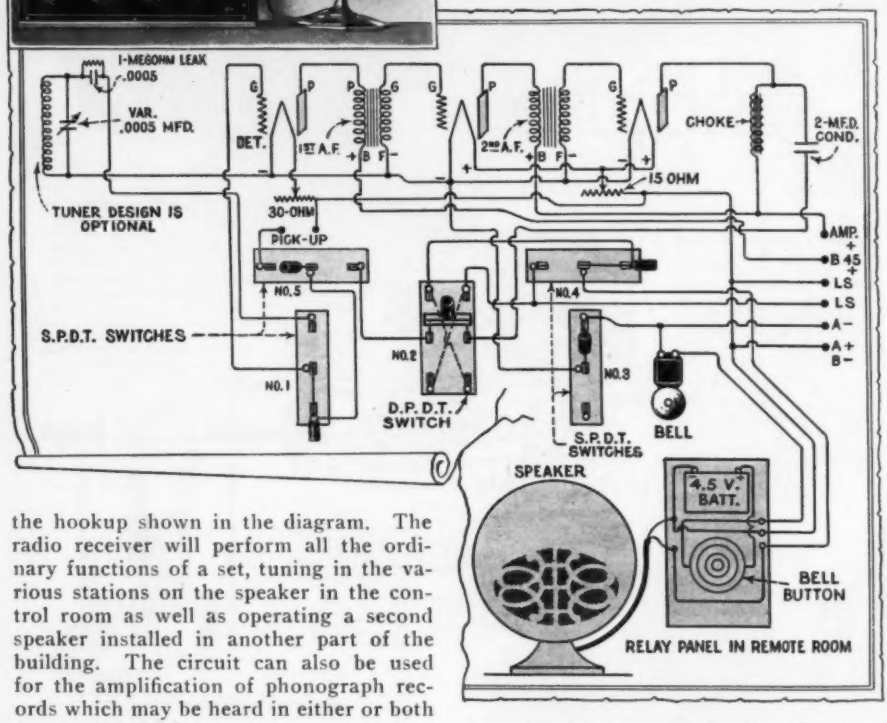
Upper Left, a Single-Throw Relay Switch Made by Changing the Terminals and Lengthening the Blades of an Ordinary Double-Pole Double-Throw Knife Switch; Above, Tube Mounted in a Portable Instrument So That It May Be Removed Easily from Above; the Metal Cover Was Obtained from the Junk Box; the Tube Socket Is Supported by Two 1-16 by ½-In. Brass Strips; Left, Soldering a Tap on an Inductance Coil Is an Easy Matter, If the Wire on the Coil Is Raised with a Toothpick

Combination Hookup for the Experimenter

By D. A. BROWN

RADIO programs, phonograph music or two-way conversation is possible with the hookup shown in the diagram. The radio receiver will perform all the ordinary functions of a set, tuning in the various stations on the speaker in the control room as well as operating a second speaker installed in another part of the building. The circuit can also be used for the amplification of phonograph records which may be heard in either or both rooms as desired.





The switches are arranged so that a person in the control room may speak to another in the room where the remote speaker is located and vice versa, to carry on a conversation both ways. Ordinary loud speakers are used for all three operations. The equipment for this domestic telephone exchange costs very little. An electric bell is installed near the radio receiver, and at the extension end there is a relay panel consisting of a push button and a small 4½-volt battery mounted as shown below.

The switchboard should be located in some convenient position near the receiver. Mount the switches just as shown in the insert photo and wiring diagram below, so as to avoid confusion when following the directions to be given.

The audio section of the set should follow the diagram closely, but the tuner may be of any type desired and is not shown in the circuit diagram. When the set is completed and the extension wires laid to the other room, the batteries and speakers are connected. Now, to tune in a station on the receiver and operate the set speaker only, place switch No. 1 up, switch No. 2 up, switch No. 3 up and throw switch No. 4 to the right. Switch

No. 5 is left out for broadcast signals. Switch No. 3 is merely a line switch in negative-A and is left closed in the up position for all operations.

To operate the extension only, on broadcast signals, place switch No. 1 up, No. 2 down and throw No. 4 to the right. Now, if the operator wishes to have the broadcast signals on both speakers, place switch No. 1 up, No. 2 up and throw No. 4 to the left. This places the loud speakers in parallel.

To use the audio amplifier for phonograph records, a standard pick-up device is connected to the terminals marked "pick-up" above switch No. 5. Place switch No. 1 down and throw No. 5 to the left. Switches No. 2 and No. 4 will now throw the speakers in and out as desired.

For two-way telephone communication, with the set speaker acting as the microphone, turn switch No. 1 down, No. 2 down, No. 4 left and No. 5 right. The operator may now speak softly into the speaker, and the person at the other speake. will hear his voice at loud-speaker volume. To listen to the reply from the other room, the operator throws switch No. 2 to the up-position. When the person at the remote speaker wishes to call the operator, he simply presses the push button to ring the bell and the operator throws the switch to listen.

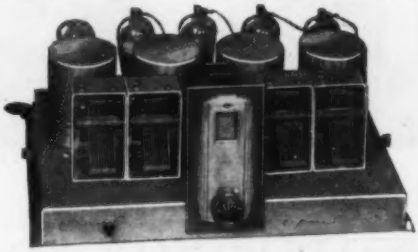
FOR THE RADIO BUILDER

The blueprints below include the best of Popular Mechanics tested circuits. When ordering, simply quote numbers of blueprints desired and inclose proper amount addressed to Popular Mechanics Magazine, Radio Dept., 200 E. Ontario St., Chicago, Ill. Magazines containing full descriptions of the circuits can be obtained. Send 25 cents for each magazine desired, giving date of publication.

No. 111,	Homemade Tube Tester	July 1926 .25c
No. 115,	15 to 550-Meter Three-Tube Receiver	Nov. 1926 .25c
No. 116,	Three-Tube Loop Set	Dec. 1926 .25c
No. 123,	Economy-Nine Superheterodyne	Nov. 1927 .50c
No. 130,	One-Tube Short-Wave Adapter	Mar. 1928 .25c
No. 134,	Edison Type B-Battery	July 1928 .25c
No. 138,	Screen-Grid Perfect-Tone Six Receiver	Nov. 1928 .25c
No. 139,	Simple Television Receiver	Dec. 1928 .25c
No. 140,	Power Amplifier and B-supply for Television	Jan. 1929 .25c
No. 142,	Two-Tube Screen-Grid Short-Wave Adapter	Mar. 1929 .25c
No. 143,	Four-Tube Screen-Grid Receiver	May 1929 .25c
No. 144,	Three-Tube Self-Contained A.C. Receiver	Oct. 1929 .25c

Tuner Employs Four Screen-Grid Tubes

Five tubes, four of which are of the screen-grid type, make this new tuner especially interesting to the DX fan. The

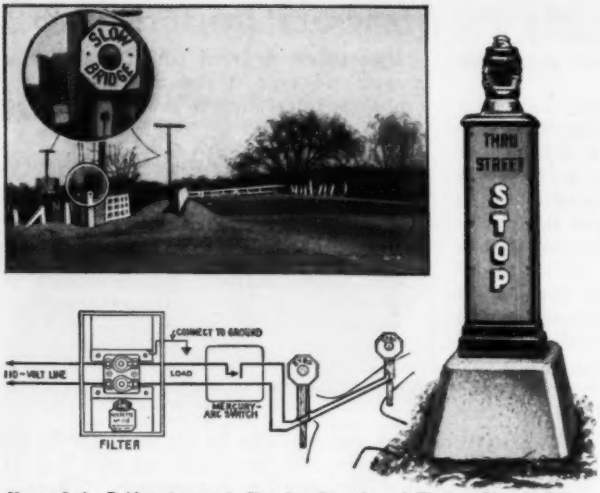


Completely Assembled Tuner Unit Showing the Screen-Grid Tubes in Position

parts are available in kit form for home assembly, and the completed unit is suitable for mounting in a console. The a.c. screen-grid tubes are used with a new type of completely shielded r.f. transformer, and a type-*227* tube is used for the detector. A feature of the tuner is the new color dial, whereby, as the knob is turned, the scale is projected in various colors on a ground-glass screen. Any good power supply and audio amplifier may be used with the tuner, but a specially designed power unit, consisting of a type-*280* tube for a rectifier, one stage of transformer audio with a type-*227* tube and a stage of push-pull amplification with two of the new type-*245* power tubes is sold completely wired by the manufacturer of the above kit.

Locating Defective Condensers in Power Units

In most cases trouble in power units is located in defective condensers. A simple and effective method of locating condenser trouble is to connect the eliminator to the light line in series with a 100-watt lamp. With the rectifying tube in the eliminator, the 100-watt lamp will glow if the condensers are shorted. It is then an easy matter to unsolder the connections on the condenser bank until the lamp goes out, and then check up on the condenser unit that caused the lamp to go out. If there are no shorted condensers and no load on the eliminator, the lamp should be out.



Upper Left, Bridge Approach Showing Location of Flasher Signal; Below, Diagram of Filter Installation; Right, Signal at Through Street

Interference from Flashers under Control

In many suburban districts, through streets are protected by flashing signals. The interference from such an installation is usually in the form of a periodic clicking which may be picked up by radio receivers located anywhere within a one-mile radius of the flasher. Similar flashing signals are used at rural crossings and bridge approaches. The installation shown in the upper photo is located near Walpole, Mass., and consists of two 25-watt lamps on opposite sides of the road, about 25 ft. apart. It caused set owners in the vicinity to look about for a remedy. A special filter designed for this form of interference completely eliminated the trouble. The local service man investigating receiving conditions in the vicinity of such flashing signals can co-operate with the local highway department in eliminating interference from this source, as these filters are now available.

Deeper Tones from the Speaker

If the depth of tone is not satisfactory, the following method will often secure the desired result: Provide three fixed condensers of .00025, .0005 and .002-mfd. capacity, and connect them, one at a time, across the secondary of the first audio transformer. If this does not produce results, group them in series and parallel across the secondary, until the desired low tone is obtained. When these condensers are connected in parallel, the capacities are added; if connected in series the effective capacity is less than that of the smallest unit in the series.

Radio Switch Clock Is Designed for Fruit Growers

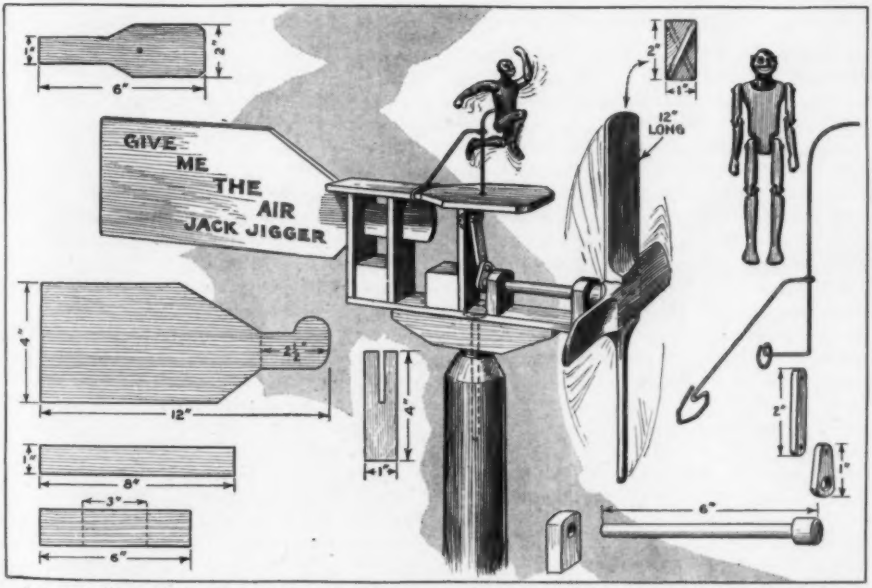
A radio switch clock that automatically turns the radio set on or off at any desired time has been especially designed for the citrus growers of southern California. The temperature readings for each district are announced by radio at frequent intervals throughout the night, and if frost is likely to appear, the grower must be wide awake and on the job. With the automatic switch, he notes the time announced for the next report, sets the dial for that time and returns to bed, knowing that he will be awakened by the radio announcer when his set is turned on at the expected time. The switch is mounted in a neat metal base upon which the clock is supported by two standards.

There are two dials, one for setting the turning-on time, and the other for setting the turning-off time. The switch is connected between the battery or light socket and the set, in series with the filament. It is designed for operation with sets employing either 6-volt batteries, eliminators, trickle chargers or with a.c. sets.

Old Favorites in New Forms

EVERY boy at some time or other makes a windmill, and for years these devices have been merrily whirling on the barn, garage or backyard fence. Of late, however, it has become quite a fad to make animated windmills of all sorts, two types of which are described in this article. The first drawing shows a dancing darky, and is the work of I. M. Monteney, of Castle Rock, Wash., while the galloping horse on the following page was designed and made by Owen Stevens, of Chico, Calif.

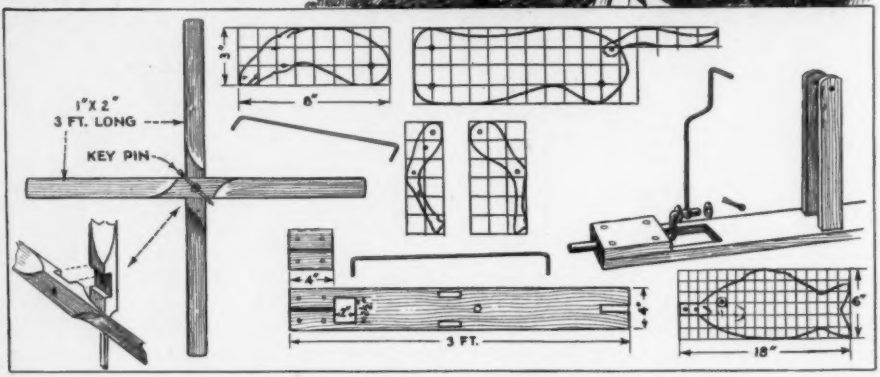
Four-bladed propellers are best to use for this purpose as they catch more air and consequently transmit more energy to the mechanism. To make a suitable propeller to operate the dancing darky, take two 12-in. lengths of 1 by 2-in. stock, such as poplar, which is easy to cut to shape. The detail at the upper right-hand corner shows how the block is cut diagonally to form a blade at each end. Remember that opposite blades must be inclined in opposite directions when viewing them from end to end, this being clearly indicated by the diagonal lines in the detail. The two pieces are mortised and nailed together in the exact center, after which the blades may be trimmed down separately to balance the whole propeller. A 6-in. shaft, cut from ½-in.



Animated Windmills Are Now the Fad; This Dancing Darky Is Always Full of Pep When the Wind Blows

dowel stock, is set firmly in the propeller hub and two hardwood blocks, drilled to receive the shaft, form the bearings. A collar on the shaft next to the hub, keeps the hub from rubbing against the bearing and thus eliminates excessive friction. The 1-in. crank arm, which is attached to the end of the shaft, is shown just above the detail of the shaft, together with a 2-in. connecting rod. A length of wire, to which

Although the Horse Keeps on Galloping without Fatigue, the Huge Fish Wiggles Its Tail and Always Keeps the Same Distance behind Him



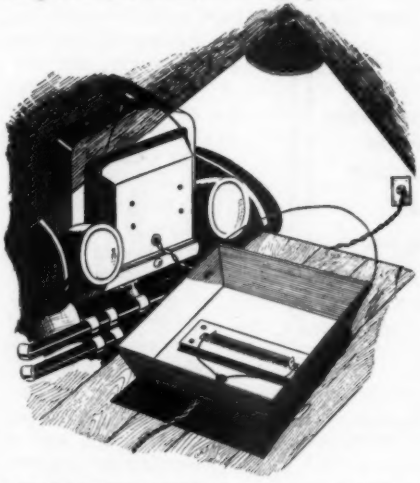
the figure of the darky is attached, is bent at the lower end to pivot on the end of the connecting rod and is supported in two bearings so that it stands vertically. The first of these bearings is formed by a hole drilled through a wooden platform, representing the floor on which the darky does his dance, while the second bearing is made by forming an eye in a length of wire, which is attached to the platform as indicated. The figure must be carefully made, the arms and legs being loosely pivoted so that they will move freely when the figure reciprocates up and down. The remaining parts of the device, including the framework, the weather vane and the base, which is fitted with a pin at the point of balance, are all clearly shown, and no difficulty will be experienced in making and assembling the device. Bright colors add considerably to the attractiveness of the windmill, and paint also preserves the wood. Take care, however, not to get any thick paint between the bearing surfaces, or on the joints of the figure. Oil applied to these points will reduce friction and also keep moisture from penetrating the wood.

Besides its obvious usefulness as a weather vane, the galloping horse, which is much larger than the dancing darky, makes a suitable adornment for the barn. The propeller is 3 ft. across and the blades are made of 1 by 2-in. wood. The drive pin, consisting of a length of light metal rod or heavy galvanized-iron wire, is securely anchored to the hub of the propeller and the other end is bent to form a crank. The crank moves a connecting rod attached to the horse's head, which is pivoted to allow a vertical movement. The legs are also pivoted and a positive movement is imparted to them by wire connecting rods, one of which is attached to the head. Thus the head and both pairs of legs move in unison, as indicated by the dotted lines. The horse can be made of either wood or sheet metal, and the vane, attached to the

rear part of the frame, is cut from sheet metal to resemble a huge fish. The impression one gets is that the horse is trying to outdistance the fish, which wiggles its tail—if this is made of thin shim brass—and swims after the horse.

An Electric Radiator Heater

In an unheated garage it is rather difficult to keep the engine reasonably warm, to permit easy starting. If desired, however, a simple electric heater can be made to fit against the radiator. Get a shallow pan large enough to fit the front of the radiator and obtain a heating coil about 6 or 8 in. long, which is designed for use on 110-volt current, and draws from 400 to 600 watts. If such a coil is not readily available an ordinary radiant electric-heater element, which can be obtained at any hardware store, will do. In the case of the coil first mentioned, it is mounted on the inside of the pan with suitable brackets, care being taken to keep it well insulated, and two lengths of asbestos-covered cord are connected to it as shown. If a heater coil is used, merely screw a cleat receptacle to the inside of the pan on a right-angle bracket so that when the element is screwed into the receptacle it will be parallel to the bottom of the pan. A bail is provided so that the pan can be hung over the radiator filling spout.



Electric Radiator Heater for the Auto Is Easy to Make and Costs Little

Holder for the Baby's Bottle

There is no necessity for holding the baby's bottle by hand, as a simple bottle

Wire Holder for the Baby's Bottle That Will Save Mother Much Time

holder, of the kind shown in the drawing, can readily be made. It consists of a length of wire bent to clamp on the bottle. Rubber tubing is slipped over this end to insure a good grip. The wire fits into a length of tubing which is drilled and tapped for a thumbscrew to permit adjustment for height. The tubing is split at the lower end and bent out so that it can be attached to a square frame by means of screws, the bent ends of the tubing being drilled to accommodate them. The frame fits under the pad of the cot, and is held firm by the baby's weight. If desired, the tubing can be attached directly to the side of the cradle instead of the square base, but this arrangement limits its use to the cradle only.—Mrs. Ruth E. Shaw, Kansas City, Mo.

Peeling Onions

When peeling onions just hold the onion in the left hand with the root end uppermost, and peel downward toward the stem end. By doing this you will find that "there is not a tear in a peck."—Mrs. J. E. Bourne, East Providence, R. I.

Simple Device for Gassing Rodents in Their Burrows Has Been Found Effective

Gassing Rodents

In cases where it is not advisable to lay poison to destroy rats and other rodents, try gassing them by the method shown in the drawing. Take an old paint drum about 12 in. long and 8 in. in diameter, and fasten the lid to the side by means of a link hinge. Punch a hole in the lid to admit the point of a pair of bellows. In the base of the drum punch a 2-in. hole, and solder a short length of sheet-metal tubing around the hole as shown. Rivet or solder a strip of sheet metal about 2½ in. wide to the inside of the drum to prevent cotton waste and sulphur, which is later put into the drum, from clogging the pipe. In use, the drum is opened and some old, oily cotton waste is placed inside and ignited. If necessary, the lid may be closed and the cotton waste fanned with the bellows to get a good glow. Usually, however, the waste will burn readily if the lid is removed. While smoking well, place the pipe in the mouth of the burrow, preferably to the windward side of the other holes. All holes from which smoke issues should be plugged up tightly. Then the drum is opened and some sulphur is sprinkled on the cotton waste, after which the cover is replaced and the bellows operated to force the fumes into the burrow. Sulphur dioxide is generated and this will kill the rats if they cannot get out.—George H. Holden, Chesterfield, Eng.

Glass-Cutting Kink

Glass cutting without special tools is usually unsatisfactory and sometimes wasteful. The ruler or yardstick commonly used, often slips when the cutter is pressed against it, and the whole piece of glass may be ruined. To avoid this trouble, cut a strip of rubber from an inner tube, about the width and length of the ruler or stick. Lay the strip under the ruler, and no slipping will occur. —F. W. Bentley, Jr., Missouri Valley, Ia.

Repairing Lawnmower

Many lawnmowers are constructed with a pawl and a ratchet wheel, as shown in Fig. 1 of the accompanying illustration. They are quickly worn so that the ratchet does not hold at all times, particularly when the cutter stops with the pawl in a horizontal position. However, the machine can be made as good as new by filing or grinding the pawl as shown in Fig. 2, grinding a twist drill to a sharper angle than usual and cutting out the ratchets as shown in Fig. 4. By using the adjacent ratchet as a fulcrum for the drill, it can be worked across the face of the ratchet, and a perfectly square face readily cut on it in a few turns.

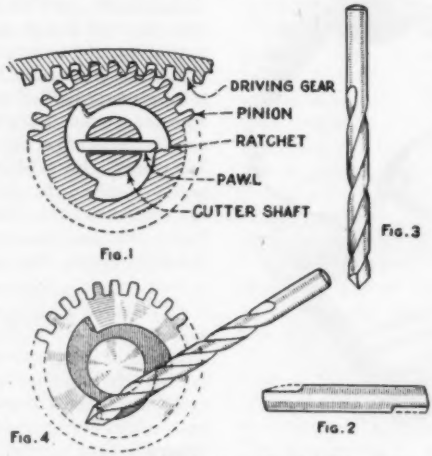


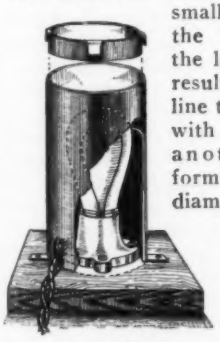
Fig. 1, the Ratchet Mechanism, Showing Wear; Figs. 2 to 4, How the Parts Are Repaired

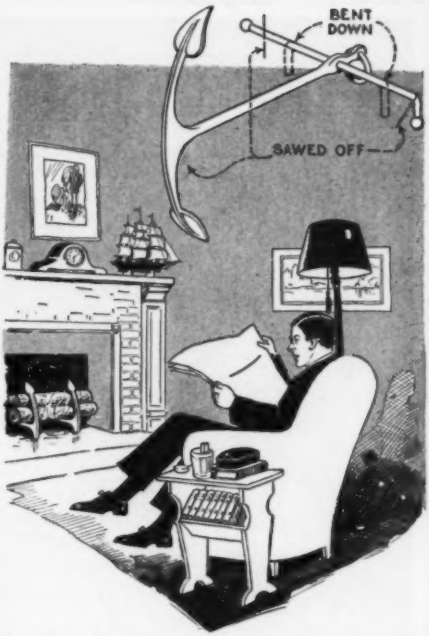
Repair for the Timer Roller of Old-Model Ford

While making a long drive, the owner of an old-model Ford had the misfortune to break a timer-roller spring and was unable to proceed. As there was no service station or telephone handy, he was at a loss what to do until he thought of taking a rubber band, which he had in his pocket, and wrapping it around the roller arm to take the place of the spring. The result was entirely satisfactory and he was able to drive to the next service station without any trouble.—Glen F. Stillwell, Collinsville, Ill.

Inexpensive Electric Vaporizer

When you wish to warm or vaporize a small quantity of liquid, or melt a solid, such as paraffin or wax, which does not require an intense heat, try the method shown in the drawing, which makes use of a 16-cp. lamp of the carbon type as a heating unit. Screw a cleat receptacle to a small piece of wood, which is used as a base. Connect a length of lampcord to the receptacle for plugging into a convenient outlet. Take a clean tin can and remove the ends so that the resulting cylinder will be about 2 in. longer than the combined height of the lamp and socket. In cutting one end leave two small lugs. These are bent over to form feet which are tacked to the base. A small notch is also cut in the bottom to receive the lampcord. For best results, it is advisable to line the inside of the can with asbestos paper. Cut another can down to form a shallow dish of a diameter a trifle smaller than that of the first. Also leave four lugs which, when bent over, form hooks for supporting it on the top of the tall can. The heat generated by the carbon lamp is sufficient to melt or vaporize the contents of the shallow dish in a few moments.—L. B. Robbins, Harwich, Mass.





Pair of Andirons for the Fireplace Made from Iron Ship Anchors

Andirons Made from Old Anchors

For the cottage or lodge fireplace, a novel pair of andirons can be made from old anchors, preferably those of the "kedge" type with a fixed crossbar. The length of the shank should not be over 20 in. to fit in the average fireplace. Plain black iron makes the most rustic appearance. Saw off one fluke about halfway between the tip and the shank and saw off each end of the crossbar near the ball and the crook as shown. Heat the ends of the bar and bend them down at right angles to form legs parallel to the remaining fluke. The height of the legs should be the same as that of the portion from which the fluke was removed. Place the andirons thus made side by side in the fireplace as shown, and you will find them quite nautical in appearance and able to support a heavy load of logs.

¶To make your shoe soles last longer, warm them and then apply two or three coats of hot copal varnish; this treatment makes the soles waterproof.

Stunts for Your

OCTOBER 31—Hallowe'en—that's the night the "ghost walks," and, believe it or not, if you can cause delicious shivers to run up and down the respective spines of your various party guests, you'll get three cheers and a tiger from everyone concerned.

Did you ever "walk the plank?" Off into the briny deep, I mean, with salt water and everything! You will need a plank, of course, and one end of this should be supported on a low box. Also, you should have on hand an ordinary sprayer filled with salt water. Your victim is blindfolded, and a guide on either side take his hands and lead him up the plank, as shown in Fig. 1. As he progresses, the guides should stoop lower and lower in order to give the plank-walker the impression that he is going up a considerable height. At the end of the plank, the victim is told to halt. The guides step away. You can give a short farewell address: "The howling sea that is upon us tonight!" At this part of the speech, someone takes the sprayer and sprays salt water in the victim's face, while another member of the "plank-walking brigade" runs a wooden paddle around in a pail of water. A sheet of tin can be shaken to get the windstorm effect. The victim is then prodded gently from behind and commanded to "yump." From all past observations, he should experience a considerable thrill in jumping down through space those few short inches.

Here's something else. No Hallowe'en party is complete without the traditional "ghost story." An excellent manner in which to put this across is to seat your guests in a circle on the floor, see Fig. 2. In the center of the circle place three or four lighted candles. As the telling of the story proceeds, the candles magically go out, one by one, until at the climax, the "Now I've got you!" stuff, the last candle goes out, leaving the room in total darkness.

The "nigger in the woodpile" isn't much. It is merely a matter of cutting the candles, taking out a small piece of

Hallowe'en Party

by Sam Brown

the wick, as shown in Fig. 3, and then putting the candles together again by slightly heating both of the cut ends. Of course, when the candle burns down to the break in the wick it will go out. Give the idea a little experimenting beforehand, so that the various candles will be properly timed.

Try this stunt: You are seated at a table. Around the table are other spectators, all holding hands, making a complete chain. The room is dark. Now, slowly and with a soft glowing intensity, a small light appears in the center of the group. It grows in intensity and form until you are horrified—or should be—to see a death head floating above the center of the table, bathed in a halo of saffron fire. The illusion lasts for a full breath-taking ten seconds, and then the head slowly fades from view. Lights! Everybody's hands clasped! Nothing on the table!

The manner of effecting this spooky illusion is quite simple. Get a hollow tube of tin or cardboard, about ½ in. in diameter and 5 in. long. Paint the outside of this tube black. Now, glue a large dark balloon to one end of this tube, as shown in Fig. 4. After the glue has set, inflate the balloon to its full dimensions, and on it, with luminous paint, paint the figure of a grinning skull, as shown in Fig. 5. Mark the tube at the free end in some manner so that you can tell, with your lips alone, whether the skull head is upside down or not. Stuff the balloon up into the tube.

And now for the stunt. You are seated at the table. Your hands are held. The prepared tube, looking for all the world like a fountain pen, is in your upper coat

pocket, or if you happen to be a "leddy," under the top of your dress. The lights are out. Now, do you see how the trick is accomplished? A simple matter to duck your head, as shown in Fig. 6, get the end of the tube, and, oh, well, the rest is just a lot of "hot air!"

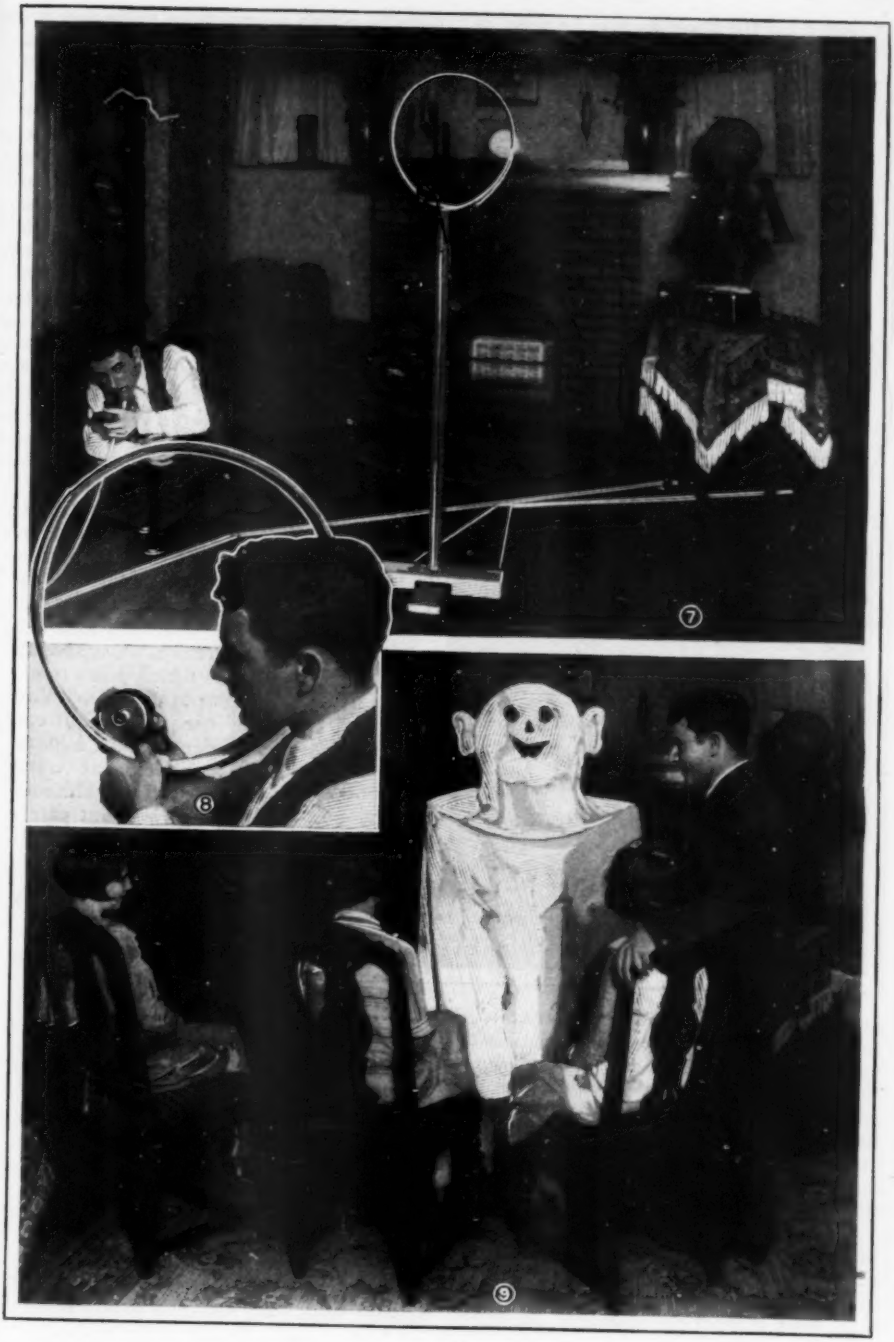
How's this? The host (that's you) brings forward to the center of the room a sheeted, ghostlike figure, which, up until then, had occupied an unobtrusive place in one corner. This ghostlike figure is introduced as the Talking Fool, Ghostland's only interpreter. This figure, as explained further, not only talks, but will answer any questions which may be asked of it. And it does—a deep sonorous voice that answers all and sundry interrogations with varying degrees of truthfulness.

No, there's no small boy concealed beneath the sheet. In fact, there is nothing at all under the sheet except a wooden pole to hold the figure upright.

Well, then, how is it done? Like this:

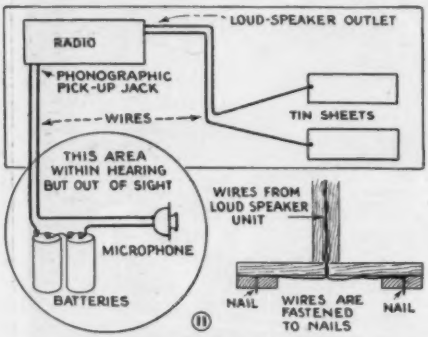
Get a small wooden barrel hoop. Get two lengths of 1½-in. half-round lumber about 4 ft. long, and two short lengths of wood, 4 in. wide by ¼ in. thick. Get a speaker unit of the type used in the average radio set and some wire. With these various things in readiness, you can very easily duplicate the figure shown in Fig. 7. The barrel hoop is nailed to the top of the two pieces of half-round molding. The speaker unit is fitted into a hole drilled through the hoop, as shown in Fig. 8, and the wires from this unit are inclosed between the two pieces of half-round. The two pieces of 4-in. wide-wood stock are used to fashion a base for the upright pole, and the wires from the speaker are fastened in place at either end of one of these crosspieces to two nails, the ends of which project about ¼ in. below the under surface of the wooden support, as shown in the diagram, Fig. 11. The idea of these nails is to allow an elec-

trical connection between the speaker unit and two pieces of tin which should



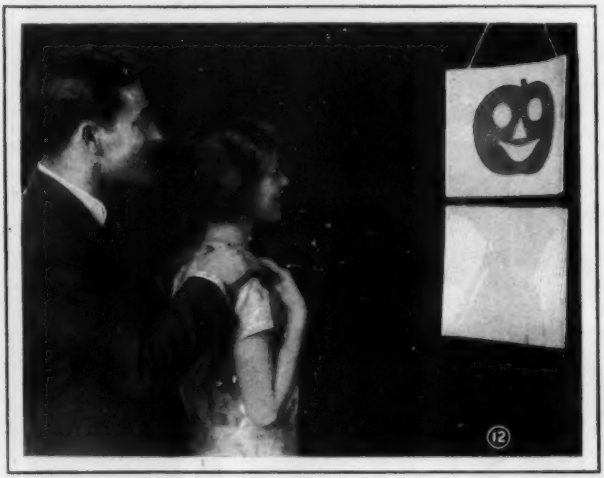
be placed on the floor, as may be seen in Fig. 7.

Are things getting any clearer? Well, two wires are bolted or soldered to the tin sections, and these wires, fastened to the floor by means of thumbtacks, lead into the loud-speaker outlet of your radio set. Now, from the phonographic pick-up jack of your set, run two wires, over the floor again, to a convenient closet or down to the basement via the hot-air shaft—anywhere that is within hearing yet out of sight. Two batteries are hooked onto this line, and a microphone ends the whole thing.



Maybe it sounds rather complicated, but the diagram shown in Fig. 11 should make the whole thing clear: A speaker unit at one end, a connection made by nail ends projecting through the rug onto tin plates, a line to the radio and out to a microphone—that's the whole outfit.

And now for the performance. You bring the outfit to the center of the floor. An old sheet has been fastened in place over the bare framework, with features painted on, as shown in Fig. 9. You take care that the figure is placed just so, in order that the nails in the crosspiece will make contact through the rug with the tin sheets. And there you are! The man at the end of the microphone should be close enough to the party group to hear the various questions. His answer is whispered softly into the microphone, it goes through an amplifying stage by radio, and comes out like the proverbial "ton of bricks" from the ghost's mouth. The assistant's voice, however close, cannot be detected because it is perfectly synchronized with the "ghostly chatter." Try it! You will find that with a little care in the concealment of the wires, everybody will be very much mystified.



Of course, there are hundreds of other spooky stunts which you can effect at Hallowe'en. You can use flasher buttons in order to make a ghost or a black cat with orange or red blinking eyes. How about painting skull heads on balloons with luminous paint so that they will glow weirdly in the dark? Painting a white skeleton on a black bag, touching it up with luminous paint, and having it shoot along a long wire from the top of the house to the garage? A wet glove, with thin sticks glued inside each finger to imitate the real bony handclasp of some departed spirit, gives a real thrill in the dark. How about writing fortunes with a solution of baking soda and water, and then revealing the fortunes by holding a lighted candle under them, causing the writing to turn brown?

But try this one: On a white sheet of cardboard, paste a large orange pumpkin cut-out, with eyes, nose and mouth of blue

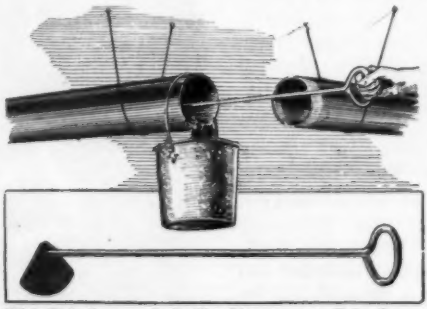
paper pasted on, as shown in Fig. 12. Hang this pumpkin face on the wall and below it arrange a second sheet of plain white cardboard, as shown in Fig. 13. If you will look the jack-o'-lantern square in the mouth as you count twenty without blinking, and then stare at the plain sheet of cardboard, you will soon see the filmy, ghostly spirit of Mr. Jack-o'-lantern—a blue face with orange features—mysteriously appear on the blank cardboard and then as mysteriously pass through the solid wall. No, Amos, there's no trick about it. It's merely a matter of retention of vision—whatever that is—and you need but try it to be convinced.

Preserving Fishing-Rod Grips

Often the cork grip of a fishing rod chips or peels off after several seasons' use. This is caused by perspiration absorbed from the palm by the cork. The trouble can be prevented as follows: Before storing the rod away wash the cork with lukewarm water and soap, scrubbing it lightly with a soft brush. It should then be rinsed and wiped, and hung in a shady well-ventilated place until thoroughly dry.

Stove-Pipe Cleaner

Everyone who has taken down stovepipes for cleaning knows how messy the job is. The writer has found it much better to disconnect the pipes and scrape the soot out as shown, which eliminates the trouble of taking them down. The scraper used for this purpose has a sheet-metal blade cut to the shape shown and having a curved edge to fit the contour of the pipe.—A. C. Schofield, Craven, Canada.



With This Scraper It Is Not Necessary to Take Stovepipes Down for Cleaning

Sheet-Metal Hood for the Motor That Protects the Outboard Aquaplaner from Injury

Safeguard for the Outboard Aquaplaner

Although outboard aquaplaning is a comparatively safe sport, there is always some danger that the operator may overbalance and fall back against the motor with painful if not serious consequences. To avoid this trouble make a sheet-metal hood, preferably of heavy aluminum, and hinge it to the deck just ahead of the motor as shown in the illustration. When starting the motor, the hood can be pushed forward so that it will not be in the way, and when running, it completely covers all the projecting parts of the motor. Sharp edges and corners must, of course, be avoided or the hood would defeat its own purpose.—D. Rockwell, Hollywood, Calif.

¶An emergency corkscrew, which will prove efficient, can be made in a few moments by straightening a safety pin to its full length and coiling it around a nail.

Cornstalk Fuselage for Model Airplane Is Strong and Durable

Cornstalk Makes Airplane Fuselage

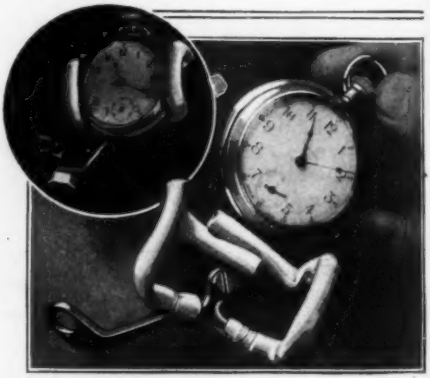
A piece of cornstalk makes an ideal model-airplane fuselage, according to Myron Alber of Beatrice, Nebr. A section of stalk, about 20 in. long, is carefully hollowed out. This can be done by means of a length of wire, one end of which is flattened and bent over at right angles to form a scraper. The shell of the cornstalk is very strong, stands considerable twisting, and completely incloses the rubber band used as motor. A balsa-wood plug is fitted into the front end of the stalk. The rear part is reduced in size by cutting out triangular sections, about 5 in. long and ¼ in. wide at the base. After these sections have been removed, the end of the stalk can be brought together and glued, leaving a hole about ⅜ in. in diameter at the end. This hole is also plugged with balsa wood in which a hook is fastened for the attachment of the rubber bands.—Dale R. Van Horn, Lincoln, Nebr.

Tinning Soldering Bits

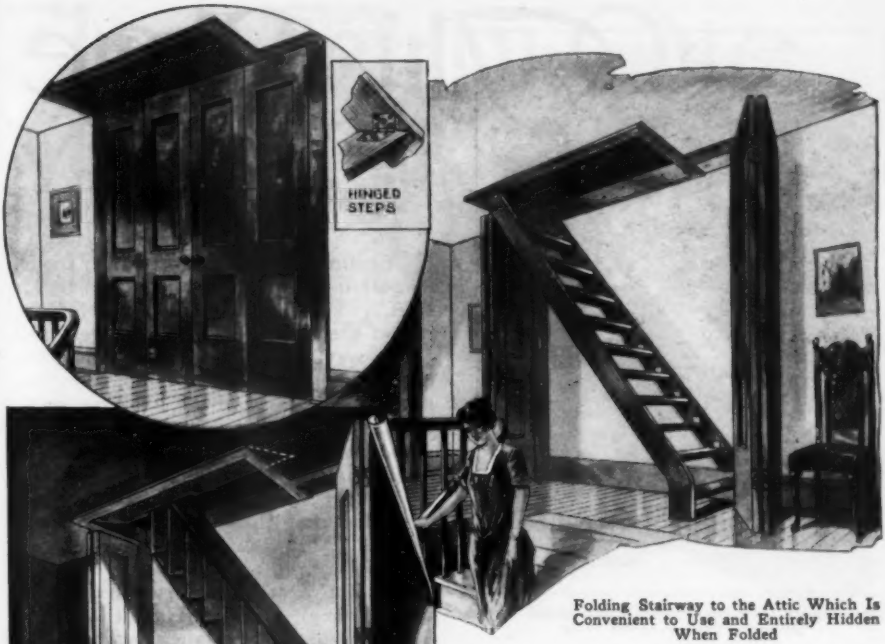
A soldering bit may be tinned without any trouble by using the following method: Get a coarse brick, a fire brick being preferable, although an ordinary red brick will do. Cut some grooves in the upper surface to receive the bits, the grooves being made a little deeper at one end than at the other. The brick is warmed enough to melt some rosin which is put in the grooves. The bit is filed bright, heated and placed in one of the grooves. A stick of solder is held against it and the bit rubbed back and forth in the groove. It may be necessary to add a little more rosin. The bit should be dipped in zinc chloride both before and after it is heated. A short rubbing in the puddle of solder will tin the bit quickly. If a file for brightening the bit is not available, rub the bit against the brick, which will serve the same purpose.

Watch Holder for the Auto

All that is necessary to make the dashboard watch holder shown in the photo, are a few inches of heavy copper wire, rubber tubing of the same length as the wire and of sufficient diameter to permit it to be slipped over the wire, and a 4-in. piece of soft iron, about 1/16 in. thick and ½ in. wide. After the tubing is slipped over the wire, the latter is bent to the shape shown, to grip the watch securely, and mounted on the iron strip by means of a short screw, the wire being bent to form an eye for the screw, and the iron strip drilled and tapped to receive it. A second hole is drilled through one end of the strip so that it can be fastened to the instrument board as indicated. The purpose of the rubber tubing is to hold the watch securely without marring its surface, and to avoid rattling.—Walter E. Burton, Akron, Ohio.



Dashboard Watch Holder Made from a Length of Heavy Wire and a Strip of Sheet Metal



Folding Stairway to the Attic Which Is Convenient to Use and Entirely Hidden When Folded

Convenient Folding Stairway to the Attic

In many a small home or summer cottage, the attic can be reached only through a trapdoor in the ceiling, which is troublesome, especially when it is necessary to lift boxes for storage. In one of the suburban homes of Boston, there is a hidden stairway which solves the problem by providing an easy and convenient access to the attic yet economizes space. Each step is hinged to the stringers so that the stairs can be folded against the wall. The trapdoor is sawed out at one side to make room for the upper end of the folded stairway and hold it securely when the door is closed. A rod near the bottom supports the folded stairs, the ends of the rod fitting in slots cut in a specially built door casing. Four doors, which completely hide the stairway when it is not in use, are hung from the casing. The drawings show the construction of the installation with sufficient clearness to enable anyone to duplicate it, if desired.—Mrs. Lillian S. Loveland, Wellesley, Mass.

Sealing-Wax Lacquer

Sealing wax, which consists mostly of rosin and shellac, is soluble in denatured alcohol and dries with a high gloss, making the solution desirable as a lacquer for decorative purposes. The sticks of wax should be broken into very small pieces and enough alcohol added to dissolve them. Unglazed pottery can be decorated with this lacquer as follows: Cut the design from a piece of printed crepe paper and glue it to the surface of the work. Both the paper and the exposed surface of the pottery are given an application of the lacquer. After this has hardened, the paper is removed and the background can be treated in another color.

This Plane

Takie Tabata with His Prize-Winning Model Plane; Note the Position of the Wing

TAKIE Tabata, a 14-year-old boy scout of Pasadena, spent three painstaking days constructing this trim monoplane. It looked pretty good to Takie, but this modest little craftsman was in no way prepared for the sensation his ship made by remaining in the air 41 consecutive minutes at the Star-News—Pitzer and Warwick model-airplane meet at Ross field, Arcadia, Calif., on June 1st.

The judges were amazed at the swift climb of this 2-oz. tractor, and when it passed out of sight beyond a tall eucalyptus tree, the timer assumed it had come to earth and stopped his watch at 10 min. 46:5 sec. Even that seemed a long flight to the timer, but the adventurous little monoplane had only begun to warm up; for 30 more minutes it soared above the fields before coming to earth again. Had it not been for the timer's error this would have set a world's record.

Of course Takie had made other model planes; many of them, and he "knew his stuff." The features which enabled the record-breaker to ride on the breeze and cover over 2 mi. are, in his opinion, the exceptionally wide wing span of 48 in. and the reverse camber of the stabilizer which tends to hold the tail down when losing speed, and preventing a nose dive. By no means did the propeller pull continuously for 41 min.; on the contrary, tests demonstrated that when wound to the safe limit of 200 turns with a 4-to-1 mechanical winder, the prop revolves only 2½ min. But in that comparatively brief space enough altitude is gained to permit duration and distance before yielding to gravity. It is estimated that this plane attained from 800 to 1,000 ft. altitude on its record flight.

Young Tabata says there are no tricks in building a duplicate of his prize winner, and he wants all Popular Mechanics model-airplane builders to have an opportunity to share his design.

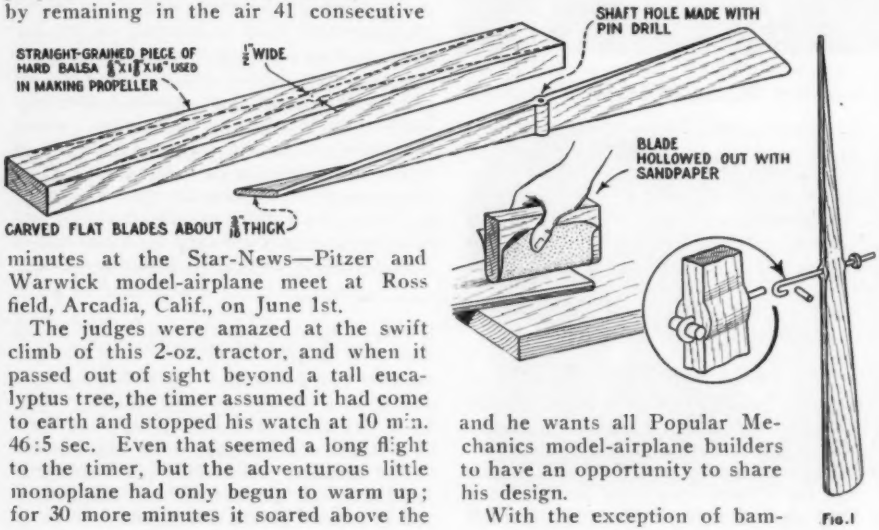

STRAIGHT-GRAINED PIECE OF HARD BALSA ⅜"X1⅜"X16" USED IN MAKING PROPELLER
⅜" WIDE
SHAFT HOLE MADE WITH PIN DRILL
BLADE HOLLOWED OUT WITH SANDPAPER
CARVED FLAT BLADES ABOUT 1/16" THICK

FIG. 1

With the exception of bam-

Flew Forty-One Minutes

by Hi Sibley

boo "wishbone" ribs in the fuselage and such music wire and washers as are required, the plane has an all-balsa framework throughout.

Begin with the two top longerons, Fig. 2, tying them together with cross-frames of the sizes shown, all of 1/8-in. square so-called "hard" balsa, which is

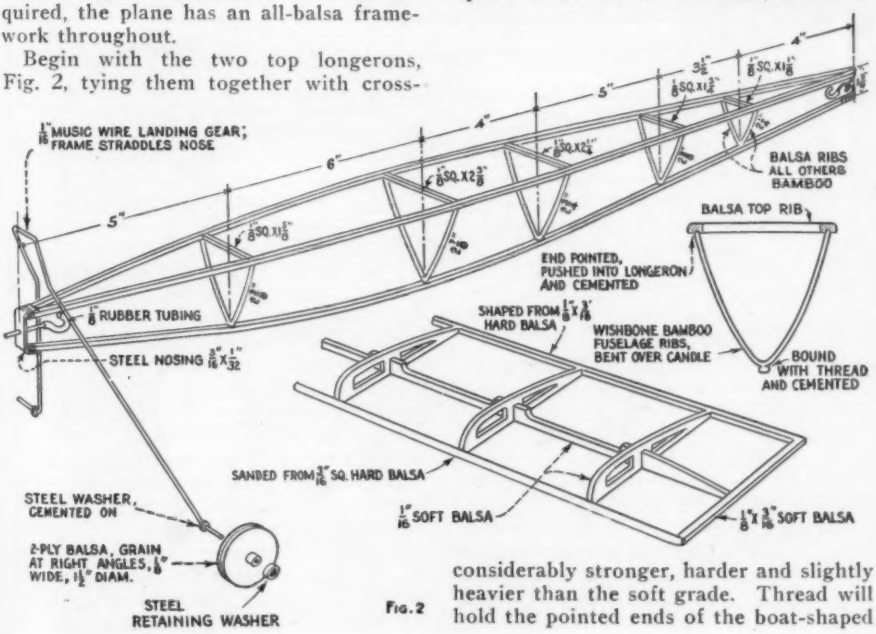
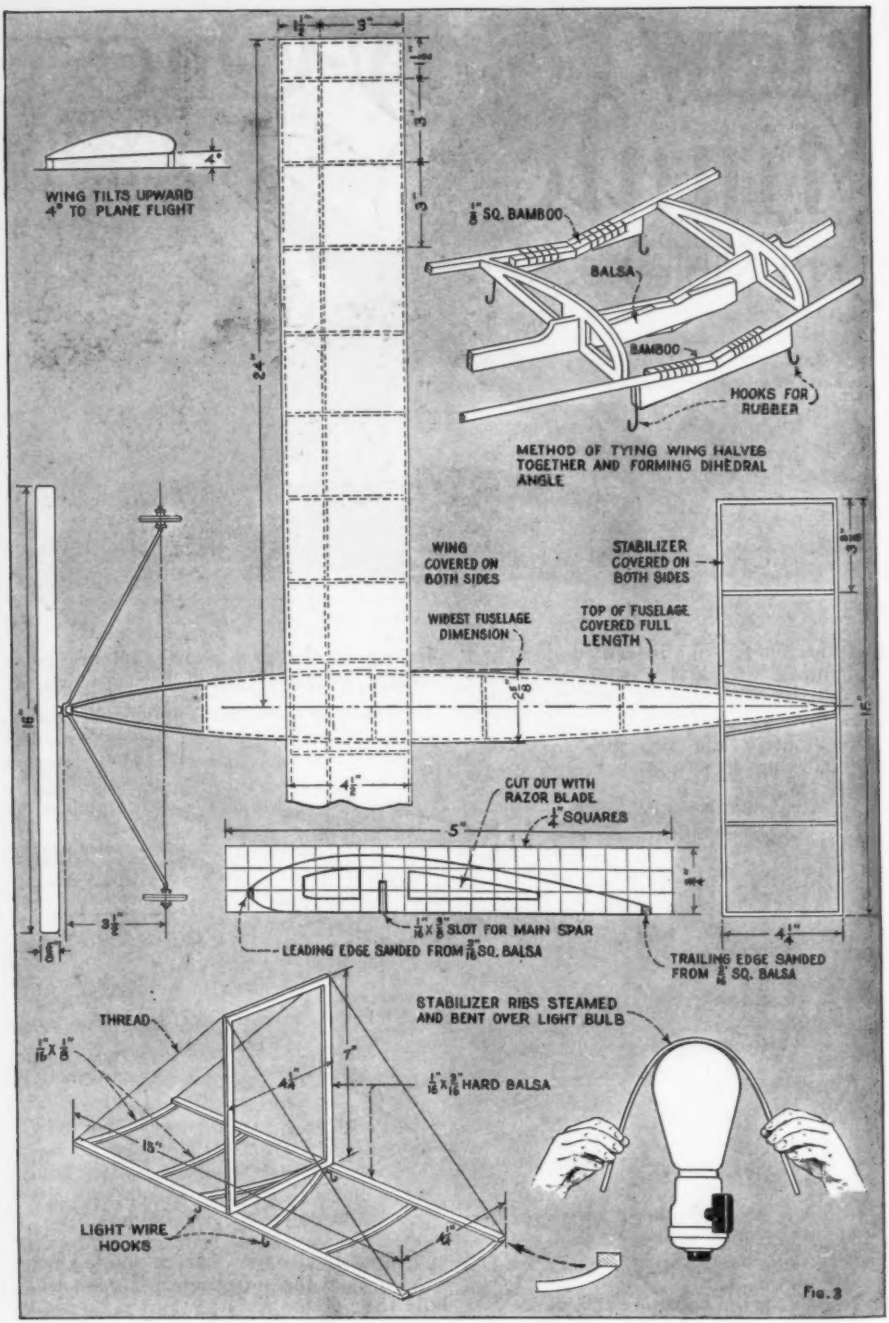

1/16" MUSIC WIRE LANDING GEAR; FRAME STRADDLES NOSE
6"
5"
4"
3 1/2"
4"
1/8 SQ. X 2 3/8"
1/8 SQ. X 2 1/4"
1/8 SQ. X 1 3/8"
1/8 SQ. X 1 1/2"
1/8 SQ. X 1 1/8"
BALSA RIBS ALL OTHERS BAMBOO
BALSA TOP RIB
END POINTED, PUSHED INTO LONGERON AND CEMENTED
1/8" RUBBER TUBING
STEEL NOSING 3/16" X 1/32"
SHAPED FROM 1/8" X 1/16" HARD BALSA
WISHBONE BAMBOO FUSELAGE RIBS, BENT OVER CANDLE
BOUND WITH THREAD AND CEMENTED
SANDED FROM 3/16" SQ. HARD BALSA
1/16" SOFT BALSA
1/8" X 3/16" SOFT BALSA
STEEL WASHER, CEMENTED ON
2-PLY BALSA, GRAIN AT RIGHT ANGLES, 1/8" WIDE, 1 1/2" DIAM.
STEEL RETAINING WASHER

Fig. 2

considerably stronger, harder and slightly heavier than the soft grade. Thread will hold the pointed ends of the boat-shaped


WING TILTS UPWARD 4" TO PLANE FLIGHT
1/8" SQ. BAMBOO
BALSA
BAMBOO
HOOKS FOR RUBBER
METHOD OF TYING WING HALVES TOGETHER AND FORMING DIHEDRAL ANGLE
WING COVERED ON BOTH SIDES
STABILIZER COVERED ON BOTH SIDES
WIDEST FUSELAGE DIMENSION
TOP OF FUSELAGE COVERED FULL LENGTH
CUT OUT WITH RAZOR BLADE
1/4" SQUARES
5"
1/16" X 3/8" SLOT FOR MAIN SPAR
LEADING EDGE SANDED FROM 3/16" SQ. BALSA
TRAILING EDGE SANDED FROM 3/16" SQ. BALSA
THREAD
1/16" X 1/8"
7"
4 1/4"
1/16" X 3/16" HARD BALSA
18"
LIGHT WIRE HOOKS
STABILIZER RIBS STEAMED AND BENT OVER LIGHT BULB
Fig. 3

frame together until the ambroid hardens at the joints of the cross-pieces. Next bend four bamboo wishbones at a sharp angle over a candle flame. The bamboo pieces should be about 1/16-in. square section, and bending should be done slowly and gently, with the glossy side of the bamboo about an inch above the flame. The ends of the bamboo are pointed and pressed a little way into the top longerons, just enough to keep them from springing out while the ambroid is hardening. When all are set, install the bottom longeron, binding it to the apexes of the wishbones with thread and ambroid.

The nosing, which serves also as a prop-shaft bearing, is of steel, 3/16 in. wide and about 1/32 in. thick, or less. Neither aluminum nor brass will carry the load properly. The rear ends are tied together with a piece of 1/32-in. music wire having a "U" bent in the center to carry the S-hook.

For such a long and thin propeller as this 16-in. job, a select piece of straight-grained hard balsa should be used. The diagrams (Fig. 1) illustrate the method of shaping the blades, substantially the same as on the prop of the Hixon-Wheaton tractor described in the September issue. The thinness of the blades is limited only by the builder's skill, but should not be over 1/16 in. at the tips. The hole in the hub for the shaft should be absolutely square with the blades and can be drilled with a tool made by flattening the end of a short section of music wire, grinding the edge sharp and chucking in a hand drill. This tool also is handy for drilling the hole in the nosing, although a fine twist drill is even better. A small steel washer is ambroided to the back of the hub, and a loose brass nut runs on the shaft behind it. All steel washers can be cut from the same size sheet steel as the nosing.

Make the wheels of 2-ply balsa by ambroiding two pieces of 1/16-in. stuff together with the grain at right angles. A short piece of brass tubing serves as the hub. Washers ambroided to the axles keep the wheel in place.

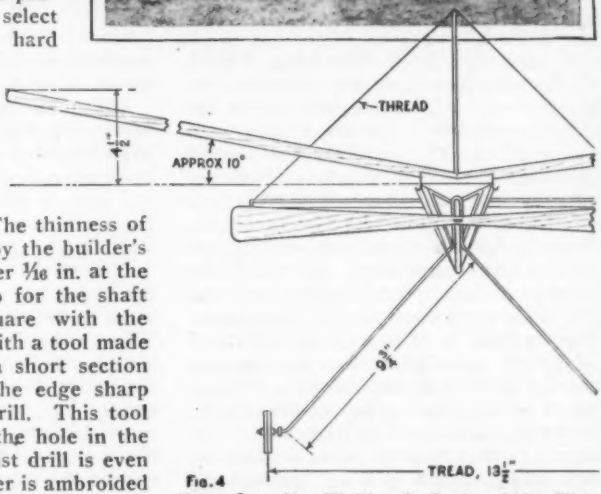
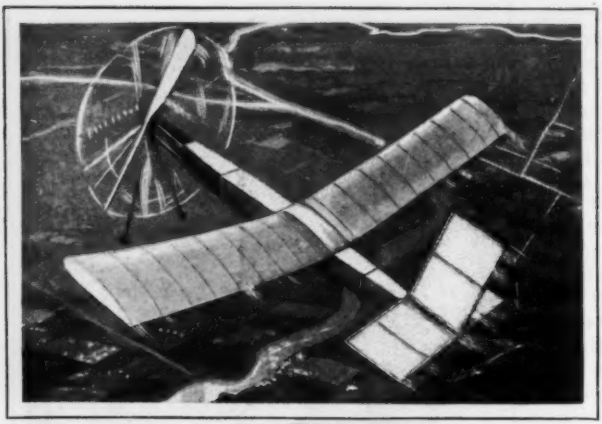


Fig. 4
Tabata Launching His Plane for Its Astonishing Flight at the Arcadia Meet, Where It Created a Sensation



When the glue holding the paper fabric is thoroughly dry, apply wing dope with a soft brush. Best results are secured with a half-and-half mixture of the dope and lacquer thinner. But do not use any dope on stabilizer or fin, as it will warp the delicate frames.

The three sides of the fuselage are covered one at a time with separate pieces of rice paper. As

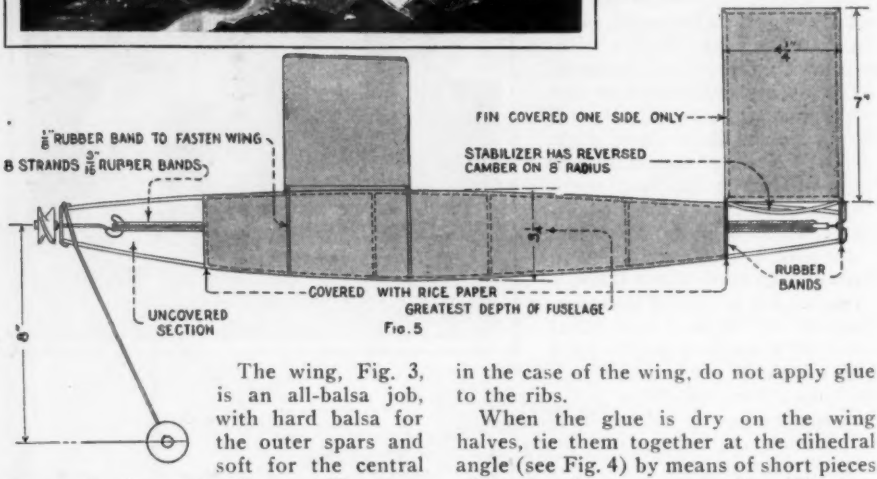


FIG. 5

The wing, Fig. 3, is an all-balsa job, with hard balsa for the outer spars and soft for the central spar and ribs. The diagram illustrates the exact size and shape of the Clark-Y airfoil used in this wing. Young Tabata used a surgeon's scalpel for cutting out the ribs and central spar. A razor blade will do. Before tying together, the two wing halves are covered with rice paper. This material is extremely fine-textured and tough, and better for the purpose than the coarser bamboo paper. Glue is applied on the outer edges of the leading and trailing spars and end ribs. Use the finger tip in applying glue; it spreads more thinly than a brush. The lightest application is sufficient. Hold the paper taut from end to end over the glued end ribs and press down with a dry finger. Then pull it taut from front to back and press down on the glued spars. Do not put glue on the intermediate ribs.

in the case of the wing, do not apply glue to the ribs.

When the glue is dry on the wing halves, tie them together at the dihedral angle (see Fig. 4) by means of short pieces of bamboo bent over a candle. The central spar is tied with a short and stout piece of balsa. All joints are ambroided and bound with thread.

In making the stabilizer frame, Fig. 3, take care that all ribs are bent on the same curve, that is, with an 8-in. radius. This can be done by steaming and bending over a lighted electric bulb, or over a wooden form. They should be thoroughly dry, however, before ambroiding to the framework. Paper is used only on the bottom of the stabilizer, and on one side of the fin, or rudder. The frame of the latter is simplicity itself, being merely a rectangle of 1/16-in. by 3/16-in. hard-balsa strips mitered at the corners. It is braced by threads to the corners of the stabilizer. A small block of balsa is ambroided to the rear center of the stabilizer to make

it level with the direction of flight, or parallel with the strands of the motor.

Balsa blocks are also ambroided to the underside of the wing at the center in order to tilt the front edge upward at approximately 4°. The most efficient angle will be determined by experiment.

Now adjust eight strands of 3/16-in. flat-rubber band so there is a little slack when unwound. By all means provide yourself with a mechanical winder, or make one from an egg beater. It is indispensable for this type of ship, since the rubbers can be wound four times as much by stretching them out. At first do not go over about 75 turns with a 4-to-1 winder. Tabata says that 200 turns with the winder is a safe limit; he has gone as high as 250, but does not recommend it.

You will get best results at first by launching in the air by hand. Give it a gentle thrust—and always into the breeze, not with it. The breeze will help it gain altitude, though in the meantime it will swing about and follow the direction of the wind.

It is of utmost importance to have all surfaces in their proper alinement. A slight variation one way or another will ruin its performance. And note from the photo how far back Tabata sets his wing—well back of the center of the fuselage. But this is precisely the position in which it made the record flight for him.

Make this wonderful little monoplane according to these plans and you will have a ship you've always hoped to own—one that flies and flies—and how!

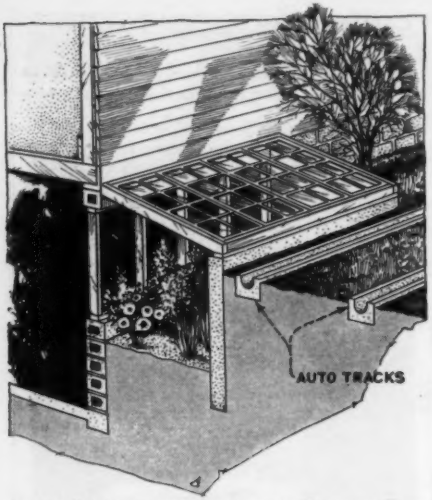
Wax Covers Barb on Fishing Hook

To prevent the barb of fishing hooks from catching on the inside of the fishing-tackle kit, cover the barb with a wad of paraffin or wax as shown. When the hook is to be used it is an easy matter to break off the wax. The writer found that hooks with barbs protected in this way could be carried in the pocket when it was not desired to carry along any unnecessary equipment.—George Woodwin, Ramea Island, Newfoundland.

Concrete Lawn Seat and Tree Guard

Besides serving as a lawn seat, a circular slab of concrete with a suitable opening in the center, as shown in the photo, makes a good guard for a small tree. It is set on three concrete blocks, although tile can be used if desired. The slab was cast on a smooth surface with two strips of tin or galvanized sheet iron on edge serving as a form. The ends of the strips were soldered together previous to pouring the concrete, the outer one measuring 48 in. and the inner one 20 in. in diameter. The inside form was laid down first and filled with sand to prevent crumpling. Then the larger form was laid about it so that both were concentric, giving a uniform spacing of 14 in. between the two all the way around. Concrete made in the proportions of 1 part of cement to 3 parts of sand, with just enough water to make a quaky mixture, was used. The supporting blocks were made by pouring concrete into small nail kegs. After the concrete was thoroughly dry (it was allowed to stand for five days) the seat was assembled and given a coating of white cement wash.—Dale R. Van Horn, Lincoln, Nebr.

Neat Lawn Seat and Tree Guard Made of Concrete Slab and Blocks



Hotbed Which Is Accessible from the Basement Keeps the Flowers Blooming during Winter

Basement Hotbed

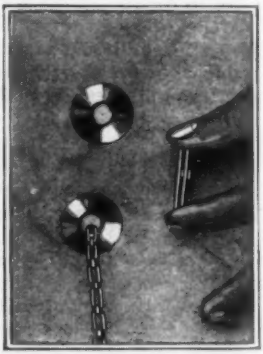
A hotbed accessible from the basement, as shown in the illustration, has been in use for several years by a Nebraska resident. A suitable opening in the basement wall was made and finished off by fitting a 2 by 6-in. frame snugly in it. A number of studs were set at 2½-ft. intervals to accommodate sash, which could be closed when desired in order to keep out furnace fumes, although these fumes were not found detrimental to plant life in the hotbed. The earth was, of course, excavated on the outside before the opening in the wall was made. The wall was made 5 in. thick and was built all around the edge as indicated. The level of the hotbed should be about 3 ft. below the lawn and the wall should project about 6 in. above it. A frame of 2 by 4-in. material was built over the hotbed, sloping from the house, and fitted with sash. One-fourth-inch wire mesh was tacked over the outside of the sash to prevent the glass from being broken by negligence or accident. Although a southern exposure of the bed is preferable, this one was built on the east side of the house and was found entirely satisfactory. As the auto drive ran right past the hotbed, the owner thought it advisable to provide concrete tracks as shown in the drawing. These were made in 6-ft. lengths, 10 in. high and 12 in. wide, with a groove of sufficient width to accommodate the auto wheel. It is almost impossible to get out of these tracks, and this eliminates the possibility of skidding over against the bed, which is likely to occur during the winter.—Dale R. Van Horn, Lincoln, Nebr.

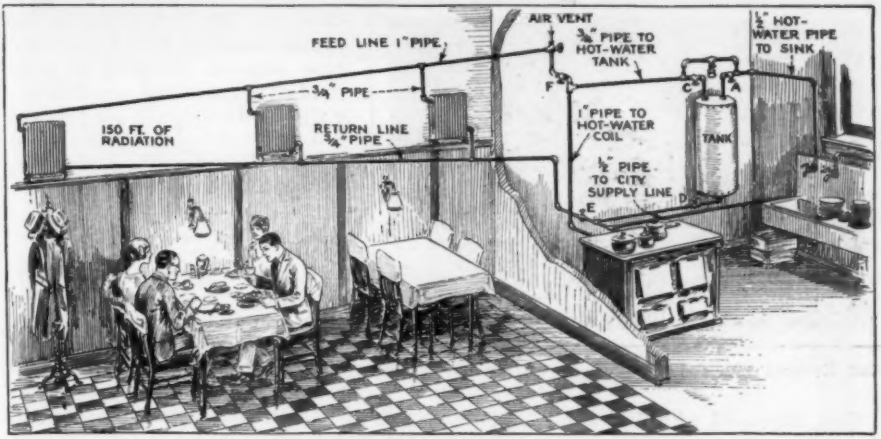
Drying Negatives Quickly

When it is necessary to dry negatives quickly, make a saturated solution of carbonate of potash, which has the property of absorbing water from gelatine. An immersion of five minutes in this solution will be sufficient, after which the surplus water must be soaked up with a blotter and the negative rubbed dry with a soft cloth. If there is not enough time to wash the negatives thoroughly after fixing, this can be postponed until after they have been used for printing. A peculiarity of this process is that the film may be stripped from its backing by cutting all around the margin, after which it may be transferred to another and used in reverse.—George Parke, Chicago.

Film-Spool Ends Make Good Grommets

Small chains used in a drilling outfit passed through some canvas covering in several places, and it was found necessary to provide grommets, but these could not be procured at once, so they were improvised from a number of old film-spool ends as shown in the photo. The raised portion of one ferrule was cut off and enlarged a trifle to go over the other ferrule when the latter was pushed through the hole in the canvas. The peen of a hammer was held over it and the hammer struck with a block of wood, beading the ferrule over and compressing the disks firmly on the canvas.





Small Cafe, Formerly Using Stove Heat, Made More Modern by the Installation of Hot-Water System Using the Excess Heat from the Kitchen Range

Heat Cafe with Excess Heat from Range

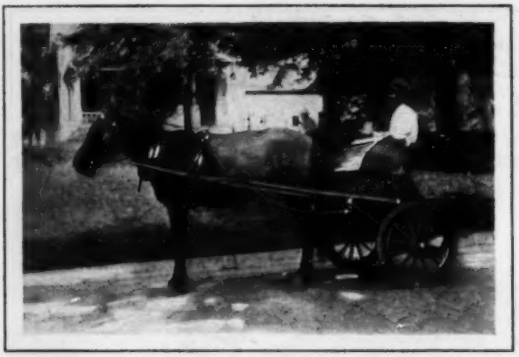
When the proprietor of a small cafe found that his range heated the water in the range tank to the boiling point much faster than he could use it, he asked a steam fitter if this waste heat could not be used to heat the dining room, where stoves were more or less unsatisfactory. The steam fitter made the installation shown in the drawing, and it has given good service for over two years. The hot water rises out of the tank into the top pipe, which runs down at a slight angle to the farthest radiator. Two other radiators are also connected as indicated. After the water has passed through them, it is cooled considerably and flows back to the heating coil in the range through a return pipe installed so that it slants toward the stove. An air vent is placed at the high point of the feed line.

Keeping Auto Free from Rust

The owner of a new car usually takes pride in the appearance of the nickeled parts of his car. If the car is purchased during the winter months, some of these parts may become partly rusted before warm weather arrives. When I buy a new car I give them several coats of light oil applied with a rag. This protects the finish by covering the nickel, and the oil can easily be removed when the weather moderates. Certain parts of the chassis and engine of a new car may show signs of rusting, but this can be prevented by giving them a coat of old crankcase oil with a brush. Keep a small fruit jar of such oil on hand in the garage for this purpose. Surplus oil may be removed with a rag. Many mechanics clean greasy parts of the motor with gasoline. This is effective, but highly inflammable. It is much better to use carbon tetrachloride and gasoline mixed in equal parts.—Ross J. Plaisted, Cleveland, Ohio.

Emergency Knife Sharpener

A knife sharpener that takes very little room, costs practically nothing and has been found highly efficient, can be made from any old metal twist drill, ⅛ in. in diameter or less. The bit is merely fastened to a table top, shelf or a piece of wood by means of two staples. Pulling the knife blade across the drill, as indicated, will produce a clean, sharp edge, equal to one made by using an expensive sharpening device.



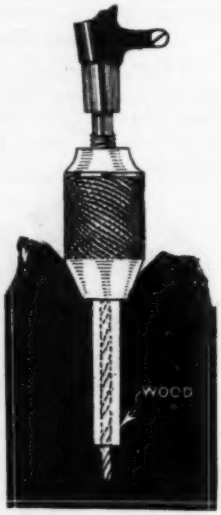
Cart Equipped with Old Auto Wheels and Casings Provides Comfort for the Driver

Cart Equipped with Old Auto Tires

Old auto casings give many miles of comfort to the driver of the two-wheeled cart shown in the photo. In a small Kansas town two carts thus equipped are in use, and the owners claim that the extra comfort is worth the cost of the wheels and tires. An additional advantage is that they are practically noiseless on paved streets.—Frank Sargent, Holten, Kans.

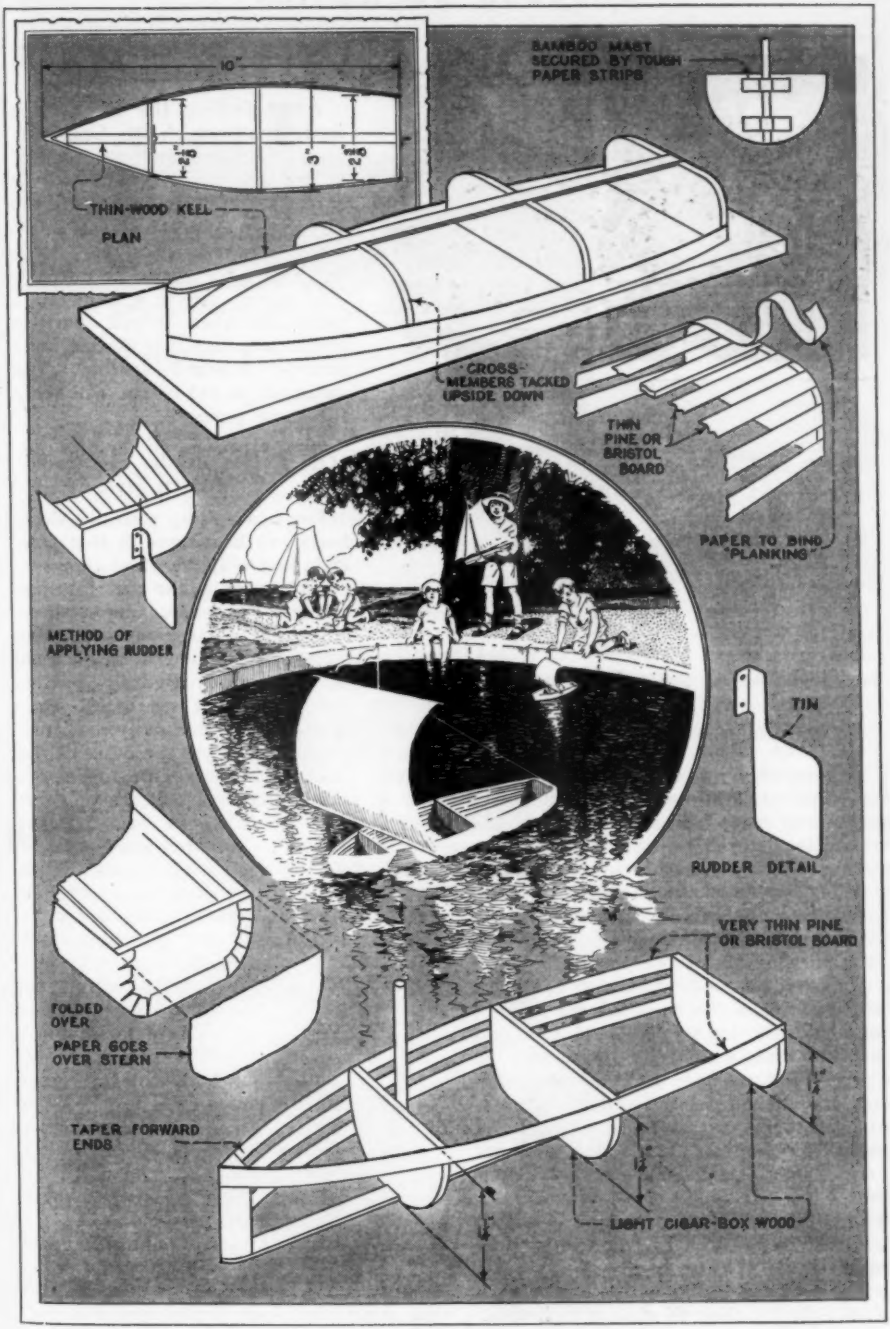
"Strait-Jacket" for Drills Prevents Breakage in Sheet Metal

When drilling holes in sheet metal with an ordinary hand drill, one is likely to bend and break the drill. A wooden jacket, as shown in the drawing, will eliminate this trouble. Such a jacket can be made in a moment. Rip out a strip approximately ¼ in. square, a piece of tonguing from an old board being about the right size. Cut it a little shorter than the drill and then run the drill through it lengthwise, as indicated. Give the drill just a few extra turns so that the chuck jaws will seat firmly against the top of the strip. This gives valuable support where it is most needed because the wood, especially hardwood, will bind on the drill and will hold tightly against the chuck jaws.—W. J. Lennox, Wiarton, Ontario, Can.

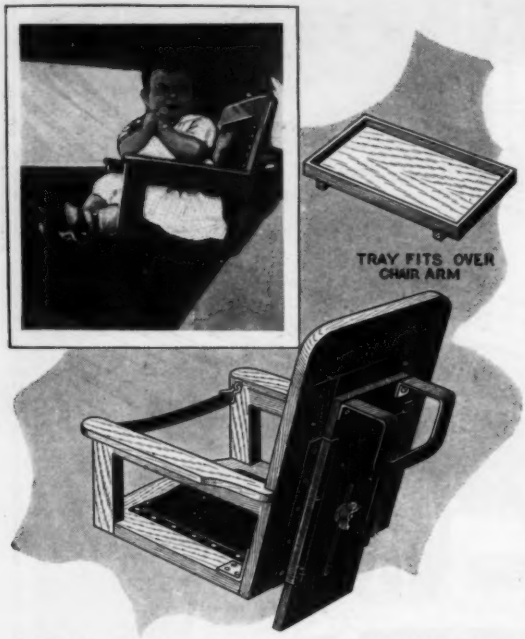


Make This Speedy Skimmer

Although the little paper craft shown on the opposite page may seem too frail to last long, it is waterproof and, with care in handling, will have surprisingly long life. It draws scarcely ⅛ in. of water and the slightest puff of wind will send it skimming across the pond like the proverbial "scared cat." Cut some strips for the lengthwise parts of the frame from three-ply bristol board. The crossmembers are made from the lightest cigar-box lids you can obtain. Get one of cedar if possible. This wood is strong enough for the purpose, very light and easy to whittle. Cut the triangular stem from white pine. To assemble the frame, tack the crossmembers upside down in their relative position on a board. Let the nails project on the underside so that they can be withdrawn easily. Thin, short brads are best for the purpose. Now lay a keel of very thin wood, gluing it in place with shellac. Gunwales are next and then the long strips. The latter are first fastened to the two central crossmembers with waterproof glue or shellac and, when dry, are similarly glued to the bow and stern pieces. The "planking" thus provided should be bound to the crossmembers securely with strips of light paper, also glued or shellacked on. Ordinary wrapping paper is now cut to cover the hull, coated with spar varnish, and applied before the varnish dries. For a rudder, attach a piece of tin, cut and bent to the shape shown, and tack it to the stern. The mast and spars are made of light bamboo splints and the sail of waxed sandwich paper. If you find that your particular model requires ballast to prevent it from capsizing, simply put a nut or washer on the floor just back of the middle crossmember. This boat has been found to outrun any model boat with sails.



This Ten-Inch Paper Boat Is So Light That It Draws Only One-Eighth Inch of Water and Develops a Surprising Speed



Small Adjustable Baby Seat Hooks over the Front Seat of Any Make of Car

Comfortable Auto Seat for Baby

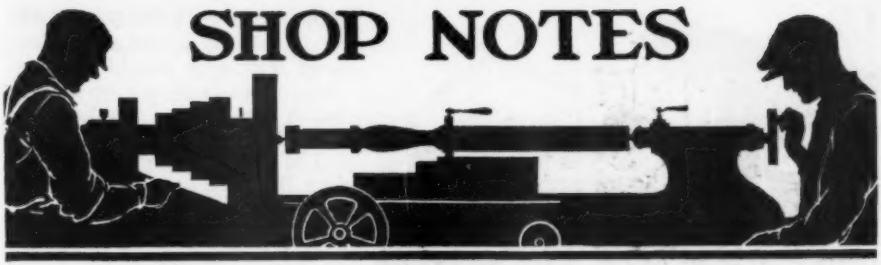
The seat shown in the drawing is home-made and can be hooked onto the front seat of any make of car. It can be made from new material or the top part of any small child's chair may be altered to suit, if one is available. A couple of slides are fastened to the back to accommodate a board by which adjustment for height is made possible. In the center of the board a slot is cut as indicated, and a hole is drilled through the back of the seat in line with the slot to receive a bolt and wingnut with which the board can be securely tightened in any desired position. A U-shaped bracket of flat iron is attached to the top part of the board and hooks over the seat. It will be found that a tray made to be clamped over the chair arms provides additional convenience. When the tray is not used a strap across the arms keeps the baby from falling forward. Besides being handy in the auto, such a seat can be hooked over the back of an ordinary chair to make a high chair. —Wayne M. Judy, Clear Lake, Iowa.

Saving Time When Repairing Inner Tubes

After finding the leak in an inner tube, which has been previously inflated, insert a pointed cotter pin in the hole. This spreads the rubber and lets the air out quickly, in fact much faster than it takes to remove the valve core for the same purpose. The cotter pin is ground to a point and then spread apart so that every time it is used it must first be squeezed together. The spout of an old oilcan will serve the same purpose.

Old Coffee Bottles Decorated in Modern Style

You can revamp your old coffee bottles in keeping with the latest style and will then find them especially popular for use on bridge tables. Get some silk cord, or any other colored cord to your taste, and wrap it around the neck of the bottles tightly. Shellac the cord after it is wrapped. Procure some carved wooden figures of suitable size to be fastened to the corks of the bottles. Use waterproof glue to do this and be sure to scrape all traces of paint and varnish from the two surfaces that are to be glued. Wooden beads can be attached to the neck with thread slipped and tied between the cord wrapping. In case you have no coffee bottles, get some similar bottles used for chemical tests. They are made of specially annealed glass, which, although very thin, will withstand considerable heat, and hot coffee can be poured into them without breaking them. The cost of these bottles is about 50 cents and the decorative material should not exceed the same amount. —Frank H. Williams, Santa Ana, Calif.



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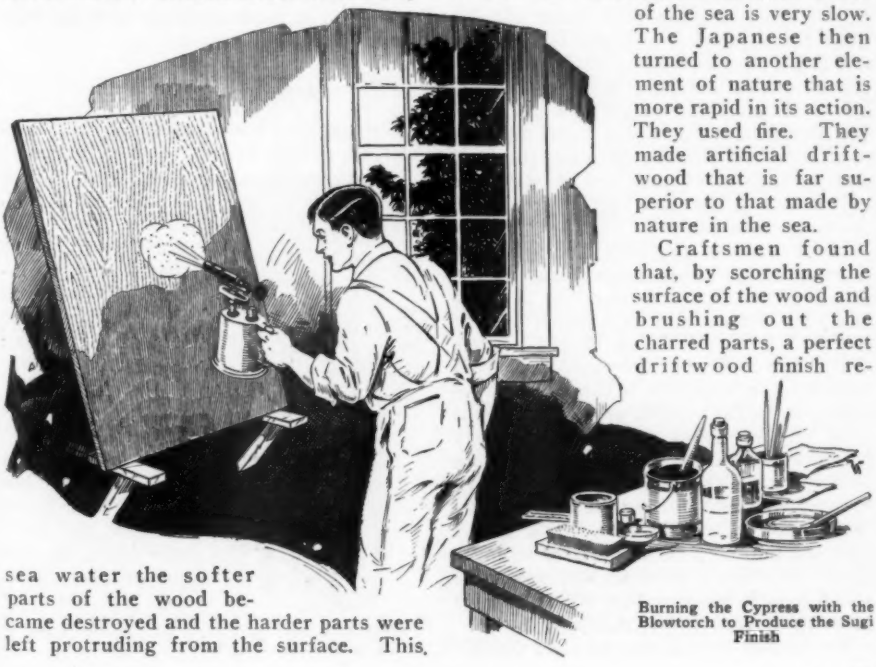
How to Apply the "Sugi" Finish

By HAROLD JACKSON

SOME of the finer arts come to us from the orient. The Japanese, especially, are very artistic people and we have learned many things from them, among which is the beautiful treatment of wood known as the "sugi" finish. Many generations ago the Japanese gathered driftwood and fashioned beautiful articles from it without artificial treatment of any kind. After continued pounding of the waves and the chemical action of the salty sea water the softer parts of the wood became destroyed and the harder parts were left protruding from the surface. This caused a beautiful embossed finish which rendered every delicate curve and irregularity of the grain in a particularly striking manner.

On account of the irregular shape and the limited amount of driftwood, the use of this naturally embossed wood was very restricted. But the Japanese craftsman was not content to sit down at the beach and wait for inferior pieces of driftwood to blow in. Besides, the chemical action of the sea is very slow. The Japanese then turned to another element of nature that is more rapid in its action. They used fire. They made artificial driftwood that is far superior to that made by nature in the sea.

Craftsmen found that, by scorching the surface of the wood and brushing out the charred parts, a perfect driftwood finish re-



Burning the Cypress with the Blowtorch to Produce the Sugi Finish

Scrubbing Out the Charred Portions with a Wire Brush

sulted, and they gave the world something entirely new and different in the way of wood treatment.

Sugi is a wood the Japanese have found to be especially adapted to this finish. Sugi and cypress are very much alike in their characteristics and the latter takes the finish just as well as sugi itself. Of the American woods, cypress is the only one that takes the sugi finish perfectly. Fir does fairly well, but a wood that has considerable difference between the hard and the soft parts, that has an elaborate and showy grain, and that is free from resin, is essential.

The process of applying the sugi finish is more simple than the reading of the instructions. Anyone can do it. A gasoline blowtorch and a wire brush are the required tools. Nothing else is needed. The entire surface of the wood is charred with the torch until it is totally black all over. Burn the surface as evenly as possible. When burnt, set the wood away for 48 hours before doing anything more to it. At the end of that time the finish is completed by brushing the charred surface with a rather stiff wire brush. Brush with the grain. This completely removes all of the charred portions and leaves the wood a rich brown color which is very pleasing to the most critical eye.

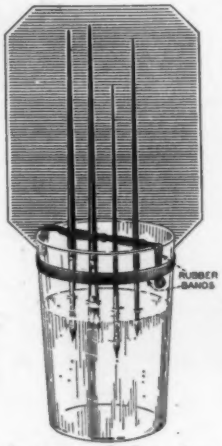
No varnish should ever be used on this finish. To do so will spoil the whole job. If a little gloss is desired wax only should be used. Rags or waste should be used to polish the surface whether wax is used or not.

The parts must be finished before they are installed. During the burning the board will warp on account of the moisture being forced to the back of the board by the application of the intense heat of the torch. This should cause no alarm, and the difficulty can be remedied by allowing time for the moisture to again adjust itself within the board. It takes about 48 hours to do this. This adjustment can be hastened by placing the board in the sun, burnt-side down.

In applying the sugi finish there are only four rules that require special attention. They are, use dry cypress, do not overburn, do not rub for 48 hours after burning, and use care in rubbing so as to get an even tone. The more you rub, the lighter the color becomes. The shade depends upon the rubbing, not the burning.

Artists' Brush Holder

Two rubber bands attached to a tumbler, as shown in the drawing, make an excellent brush holder for artists. Three knots are tied in one of the bands at equal intervals. This band is stretched over the top of the glass and another band is snapped around the glass to hold the first one. The brushes are slipped between the knots so that the bristles dip in the water without touching the sides or bottom of the glass, which allows them to retain their shape.

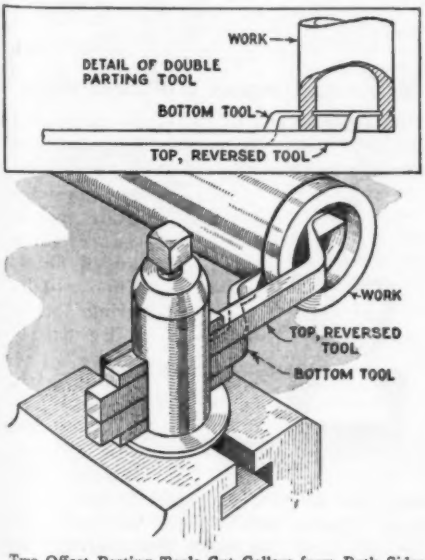


Removing Tar and Asphalt Spots

Do not use soap on tar or asphalt spots on cloth, as this will set it in a way to make the cleaning almost impossible. Rub the spots with soft grease, and set aside until the grease penetrates the tar. Remove the tar and grease with gasoline, or by washing in hot suds. Asphalt should be wetted with kerosene and left to stand, then washed in turpentine or alcohol.

Double Parting Tool

The time required to part off work in a lathe can often be reduced by one-half if the arrangement shown in the drawing is used. In the case illustrated a piece of tubing is being parted to make collars. Ordinarily a parting tool will cut freely until it gets into the cut a short distance and then it is likely to clog because the cuttings do not clear themselves. By using two parting tools as shown, neither tool cuts into the work enough to permit clogging. Both tools are offset and are mounted one over the other in the toolholder. However, as it takes more time to set two tools than a single one, this arrangement is not suggested as a time-saver for cutting a single collar.



Two Offset Parting Tools Cut Collars from Both Sides of the Tubing

Forked Tool Made from Pipe and Fittings Helps Remove and Replace Heavy Disk Wheels

Forked Tool Helps Mount Disk Wheels

Heavy disk wheels of the demountable type can be put on the hub with little exertion if the illustrated tool is used. It consists of pipe and fittings and has a forked end which is slipped under the wheel while the other end serves as a handle. The method of using it is clearly shown. Anyone who has changed disk wheels will appreciate this helpful tool.—G. A. Luers, Washington, D. C.

Weight on Mower Lightens Tongue

The weight of a mower tongue together with the vibration of the machine, will usually cause sore necks on a team of horses after a day or so of steady work. One farmer suspends a cement block from the seat by means of a strong strap, which counterbalances the tongue and also absorbs some of the vibration.—J. R. Gentry, Lincoln, Nebr.

¶In the absence of a brace to hold your wood auger, get an ordinary faucet handle and slip it over the square tapered end of the auger so that it can be turned by hand.

Developing Sodas Can Be Dissolved Quickly by Dusting Them in the Water and Rocking the Tray

Quick Method of Making Photo Solutions

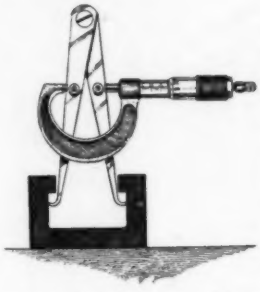
Ordinarily, when making developers, the sodas, stirred into a tray of water, set in chunks as hard as rock before they can be scattered sufficiently, and many minutes are lost before they are all dissolved. The drawing shows a method which greatly reduces the time needed to dissolve them. First, be sure that the sodas are thoroughly powdered. Put the water for the solution in a large tray so that it will not be too deep. Lift one end of the tray and rock it steadily without allowing it to slop over the ends. Sprinkle the soda powder evenly in the water, in the middle of the tray where the washing action is strongest. With a little practice, this can be done so that no lumps will be formed, the swishing of the water keeping each tiny grain in suspension and almost instantly dissolving it. In a timed test, 1 oz. of carbonate of soda was dissolved in 10 oz. of water, by stirring and crushing the lumps after they were formed, in 12½ minutes at 65°, for perfect solution. When the same quantity was dissolved by sprinkling it in as the tray was rocked, complete solution was accomplished in 3 minutes. In dissolving larger quantities, the use of a salt shaker makes it impossible to drop too much soda into the water accidentally. This method holds good only with powdered sodas, but as they are the kinds almost universally used, the busy photographer can save many valuable minutes. When the sodas are mixed separately, the sulphite will give little trouble, but most ready-mixed developers for amateurs will have them combined, and the carbonate will control both.—C. K. Van Druff, McLouth, Kans.

How to Prevent "Offset" in Printing

On a rush job where printing was necessary on both sides of the paper, and there was not enough time to permit the first run to dry properly before backing up, the makeshift method of preventing offset described below was used with success. Sufficient packing was removed from under the draw sheet of the jobpress platen to allow for a sheet of ordinary print paper. This sheet was pasted along the top of the platen and extended to the guide pins to which the work was fed. After 50 to 100 impressions had been made, the sheet was replaced with a clean one. This method saves time and gives permissible results where speed is essential on an ordinary run.—Edgar Sherman, Tucumcari, N. M

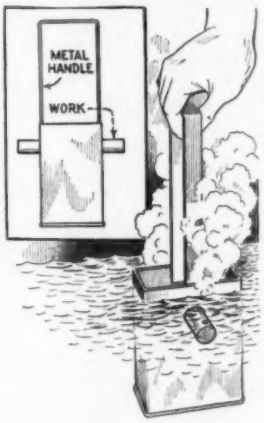
Measuring Diameter of Flanged Holes

By equipping a pair of inside firm-joint calipers with toolmakers' buttons as shown, one can take accurate measurements in flanged holes. When a calipering job is to be done, "mike" the buttons with the caliper points set inside of the flange. Remove the calipers and reset them to the same distance between the buttons, and you will have the exact diameter of the hole inside the flange at the caliper points.



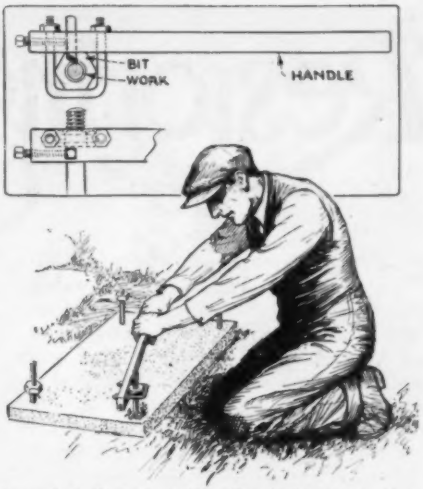
Can for Local Hardening

It is often necessary to harden both ends of a piece of work and leave the middle section soft. When the piece is short, as in the case of link pins, it is a rather difficult job to do this. If one end is hardened at a time the heat is likely to travel along the pin and soften the end previously hardened. As it is out of the question to heat the ends at the same time and leave the center cold, the next best thing is to heat the whole surface of the pin and keep the central portion away from the water when the ends are quenched. The photo shows a simple method of doing this. Obtain a tin can and drill a hole through the sides, about 1 in. below the top, making the holes a trifle larger than the pins, so that these can be inserted and removed easily. For convenience a stiff handle may be affixed to the can. In use, a pin is heated to the right temperature, pushed through the holes in the can and the whole dipped into the water until the pin is submerged, but not the top of the can. Of course, some water leaks through the holes but the ends of the pin are thoroughly cold before much water gets into the can, and the center section is too cold to be affected by the water, so that consequently it remains soft.—Harry Moore, Hamilton, Canada.



Cutting Threads without a Die

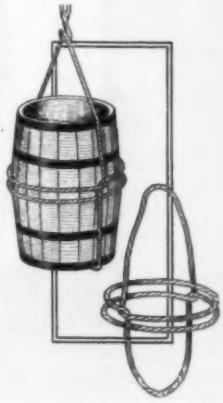
After bolts had been set in the concrete foundation for an engine, it was found that the threads were not cut far enough down to allow the nuts to be tightened on the engine bed. Not having a threading die, the makeshift method shown in the drawing was used with good results. A nut fitting the thread was attached to a steel bar near one edge by means of a U-bolt. A threading tool was put through the bar near the other edge and was held in place by a long setscrew. By rotating the nut with the bar and feeding the tool lightly with a hammer for each cut, the threading was accomplished in a short time, and the job was found entirely satisfactory.—August Jeffers, Bedford, Ind.



Improvised Method of Threading Bolts Set in Concrete Foundation

Simple Method of Slinging a Barrel

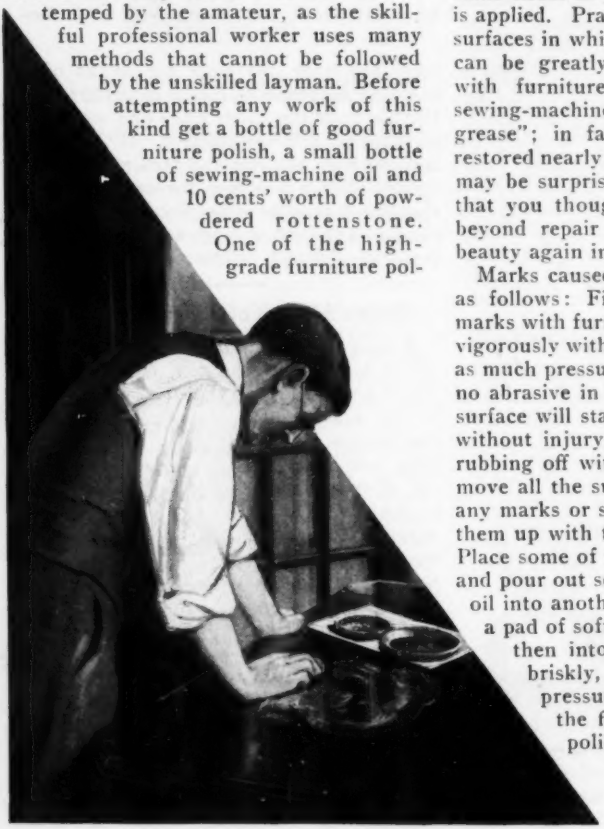
A simple method of slinging a barrel, which is open at the top, is to put the barrel on the sling so that the latter comes in the middle of the bottom. Then take one side of the sling and put a half hitch around the barrel near the top, but not too close to the edge. Take the other side of the sling and put another half hitch around the barrel just above the first. The barrel can now be safely hoisted.—C. Newkirk, Chicago.



Restoring Damaged

By BERTON ELLIOT

BY FAR the greater part of the furniture in use today is stain-finished walnut, mahogany or oak. As some pieces of furniture receive harder wear than others, and as frequently one piece of a suite meets with an accident, some practical information on the restoration of such pieces should be of general interest in every home. Of course, the processes described are only those that can be attemped by the amateur, as the skillful professional worker uses many methods that cannot be followed by the unskilled layman. Before attempting any work of this kind get a bottle of good furniture polish, a small bottle of sewing-machine oil and 10 cents' worth of powdered rottenstone. One of the high-grade furniture polishes, sold by paint-supply stores to furniture repair men, is best, if procurable.



Light Damages to Furniture Surfaces Can Often Be Removed by a Brisk Rubbing with Rottenstone and Oil

Light damages to the finish of a piece of furniture, which have not dug down into or through the stain in the wood can be inspected by wetting the finger and rubbing over the bruise. If the bruise is not through the color it will be practically unnoticeable when wet and will show the same effect as you will get when varnish is applied. Practically all varnish-finished surfaces in which there are light damages can be greatly improved in appearance with furniture polish, rottenstone and sewing-machine oil, and plenty of "elbow grease"; in fact, most of them can be restored nearly to their original state. You may be surprised to find that a table top that you thought was practically ruined beyond repair can be made a thing of beauty again in about 20 minutes.

Marks caused by hot dishes are treated as follows: First try to polish out the marks with furniture polish, rubbing them vigorously with a soft cloth and using just as much pressure as possible. As there is no abrasive in liquid furniture polish the surface will stand a good deal of rubbing without injury. Give the surface a final rubbing off with a dry, clean cloth to remove all the surplus polish. If there are any marks or spots that show dull, polish them up with the rottenstone as follows: Place some of the rottenstone in a saucer and pour out some of the sewing-machine oil into another shallow receptacle. Dip a pad of soft cloth into the oil first and then into the rottenstone, and rub briskly, but with not too much pressure, over the dull spots on the finish. This will not put a polish where there is no finish,

Furniture

The Top Which Looked Beyond Repair Is Polished to Look Like New with Little Effort

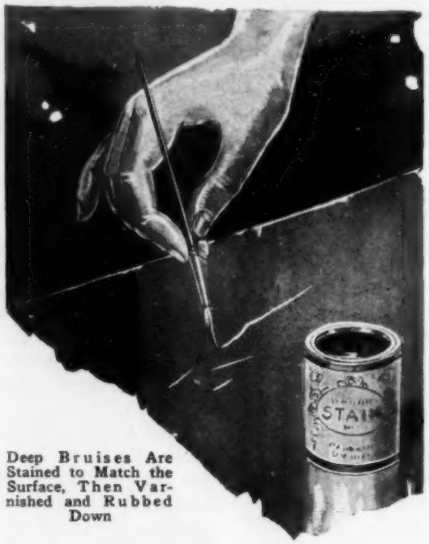
as a foundation is a necessity, but if there is any finish at all it will be improved. Give the entire surface a rubbing off with a clean cloth to remove the sludgy mixture and polish again with furniture polish. By working on a table, buffet or dresser top with the furniture polish and rottenstone alternately for 20 to 30 minutes, it can be brought up to a fine finish, with all light blemishes rendered practically, if not entirely, unnoticeable.

A dresser on which perfume has been spilled, the luster spoiled and the finish roughened, can be restored so that the blemish is hardly noticeable. The remedy depends on how bad the blemish is. If the perfume was wiped up immediately after spilling, a vigorous rubbing with furniture polish or rottenstone and oil may bring up the finish so that it will be quite satisfactory. If the pieces are too badly roughened to be finished in this way, the best thing to do is to give the top a finishing coat of varnish, unless the piece is an expensive one and requires the services of an expert craftsman for refinishing. The ordinary piece of furniture, however, especially golden oak and other furniture in gloss-varnish finish, can be satisfactorily refinished by the home worker in the following way: Sandpaper the place where the perfume was spilled until perfectly smooth, and also sand the rest of the top lightly, using sandpaper not coarser than No. 00, No. 0000 being preferable. Dust the surface carefully and then apply a coat of high-grade interior finishing varnish over the entire surface. If the finish was in extremely bad condition from the perfume, it may be necessary to apply two coats of varnish, in which case the first coat should be sandpapered lightly or rubbed over with fine steel wool, after drying for at least 48 hours. The final varnish coat may be left in full gloss or rubbed to a semi-dull finish after drying 48 hours, by using steel wool of a very fine grade, dipped in linseed oil, or by using pumice stone and oil. Some prefer to give a piece a finishing coat of flat-drying varnish, following the gloss-varnish coat, instead of rubbing, which produces a very beautiful semi-dull finish, although not having quite the richness of a hand-rubbed job.

If some of the varnish finish has been chipped off, but the color still remains in the wood, clean the disfigured part thoroughly with soap and water. Rinse off with clear water and allow to stand until

absolutely dry. Sandpaper the entire surface lightly, feathering the edges around the chipped place so that they taper down gradually instead of forming a sharp indentation. When this has been done, apply a coat of varnish over the entire surface. In case this does not produce a perfectly smooth finish, without showing any trace of the chipped place, sandpaper lightly again, and flow on another coat of varnish, after the first coat has been allowed to dry for 48 hours. This can, of course, be rubbed or given a finishing coat of flat-drying varnish, as previously mentioned.

Deep bruises that go down into or through the stain in the wood will show up distinctly even when rubbed with a moistened finger. Such damages are more difficult to repair than light ones, especially for the amateur who has not the equipment and cannot well attempt the more intricate processes open to the professional finisher. With injuries of this kind the color is more or less gone and must be supplied in some way. The method usually employed by skilled furniture patchers is to fill the dig or abrasion with a material known as "stick shellac" or "furniture finishers' stick cement," which is melted into the abrasion and smoothed with a hot knife. This material comes in colors to match the popular hardwood finishes, and is of a transparent nature so that the grain of the wood shows through. After the stick shellac has been melted in or "burned in," the entire surface is polished off, which the professional finisher usually does by a process known as French polishing. This is the only method that will permit good matching of deep damages. However, unless one is skilled in the work, he is likely to make a mess of it, so that the finish will look worse than before.



Deep Bruises Are Stained to Match the Surface, Then Varnished and Rubbed Down

For less conspicuous surfaces and articles where a flawless repair is not necessary, the following method may be used satisfactorily. Work a little stain into the bruise so that it colors the exposed wood to about the same shade as the finish. A "penetrating" stain is best for this purpose and may be obtained in all of the popular hardwood effects. It should be worked into the abrasion with a small camel's-hair penciling brush, and the surplus stain wiped off quickly with a cloth, to prevent coloring the wood too dark. If the effect is found to be too light, work in a little more stain and wipe off again, repeating the process several times if necessary, until the color matches the rest of the surface. When the stain is thoroughly dry carefully flow the scratch full of varnish with a small camel's-hair brush. When the varnish has dried thoroughly for at least 48 hours, go over it a few times with a dry cloth and then rub the entire surface with furniture polish. It may also be necessary to use rottenstone and oil as previously described. If trouble is experienced in dulling down the gloss of the varnish patch to match the rest of the surface, rub over the glossy place lightly and carefully with a small piece of fine steel wool, then polish up the surface again. This should produce a uniform effect. In case it is found that the stain applied to the abrasion did not darken the bruise sufficiently to match the rest of the surface, a touch of stain may be applied over the filled abrasion with a small brush.

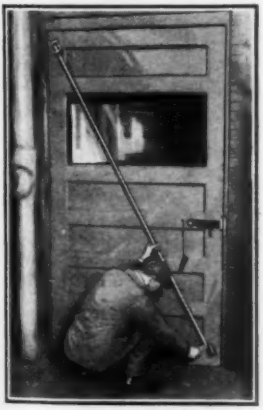
Water marks in furniture greatly detract from its appearance. Some kinds of varnish will not stand water without be-

coming white. If, for example, a wet bathing suit or towel is left on a chair for any length of time, it may be found that the surface has turned to a very pronounced grayish color wherever the wet article has touched it. While this disfigures the piece seemingly beyond repair, all that is necessary is to sandpaper the surface with very fine sandpaper and apply a coat of varnish. The cloudy effect entirely disappears with this revarnishing. The new finish may be left in full gloss or the glare may be softened to a semi-dull luster by rubbing down as described.

Clear lacquer has recently come into extensive use for the finishing coats on stain-finished furniture, instead of varnish. For the finest possible patching of lacquer-finished pieces somewhat different methods than those described are employed in the professional shop. However, for the home worker, the methods described in this article may be used, the slight differences in luster between the varnish patch and the lacquer being taken care of by polishing or rubbing the patch after the retouching has been finished.

Brace Keeps Door from Sagging

When a heavy door begins to sag it is often quite a task to remove it to plane off the edge. Sometimes a door will keep on sagging and if constantly planed it will be out of square to a noticeable extent. In places where appearance is not of utmost importance the diagonal brace shown in the photo will keep the door from sagging.



It is simply a rod or length of pipe that is threaded at both ends and slipped through two brackets fastened to the door. Tightening a nut on each end pulls the door back in proper alinement.—A. Mathieu, Chicago, Ill.

Handle for the Bench Screw

Bench Screw, Turned by Means of a Crank Handle, Reduces the Time Spent in Adjusting Vise

While using a bench screw, a home-workshop owner devised a simple crank handle which enabled him to turn the screw in and out much faster than was possible with a handle of the usual type. It was made of pipe and fittings, as indicated in the drawing. The tee which accommodates the handle is drilled and tapped to receive an L-bolt, which, when tightened, holds the handle securely.

Bands for Bandsaw Wheels

We were in need of bands for our bandsaw wheels and did not have time to wait for new ones. It was therefore necessary to improvise some bands, which we did in the following way: We purchased a quantity of adhesive tape of the same width as the width of the bandsaw wheels. This was wrapped on the wheels and found entirely satisfactory.—F. L. Jester, Bainbridge, Ga.

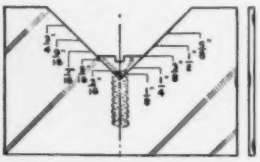
¶An easy method of repairing a leaky bucket or a tin gutter so that it will last a year or more is as follows: Paint the metal inside and out, then paint one side of a strip of cloth and apply it to the inside painted surface of the metal.

Footboard or Treadle with Pivoted Hook Holds Work Firmly in Sawbuck

Holding the Work in the Sawbuck

When sawing wood on a buck, it will be found best to hold the work firmly, which can be done by means of the foot clamp shown in the drawing. It consists of a 3 or 4-ft. piece of 2-in. stock, to one end of which a ½-in. iron rod is pivoted, the rod being shaped to form a hook at one end and an eyelet at the other, where it pivots in the footboard or treadle. The hook is ground to a point so that it will grip the work securely. Pressure of one foot on the treadle suffices to keep the log from turning while being sawed.—Leslie H. Phinney, Orange, Mass.

Template for Drawing Angles of Machine-Screw Heads



In our plant flat-head machine screws are made, ranging from ⅛ to ⅜ in. in diameter, and the included angle of the heads is 70°. The time required to lay out the angles on the drafting board has been greatly reduced by the use of the illustrated template, made of celluloid. It is placed against the T-square with its center line coinciding with that of the screw. The horizontal lines on the template give the exact position for the top of screws of various sizes. The angle of the head is first drawn, leaving the lines for the top and the slot to be filled in later with the use of the T-square and triangle. Cuts on the underside of the template, near the top, provide ready means for lifting it up from the drawing. —August Jeffers, Bedford, Ind.

Feeding Paper on Job Press

On many job-printing presses, especially where a solid foundation is lacking, the feeder is continually annoyed and frequently some valuable paper stock is ruined, because the vibration makes it work off the feed board. The trouble can be remedied by cutting two wide bands from an old inner tube and slipping them over the feed board crosswise of the way the stock is fed into the press.—Edgar Sherman, Tucumcari, N. Mex.

Two Screwdriver Kinks Worth Knowing

A small metal pipe cap fitted on the end of a screwdriver will protect the handle against damage when used for tapping. Also the handle can be given a blow with a hammer without the risk of splintering the wood. Drill a hole in the handle under the cap and fill the hole with a mixture of white lead and tallow, which when applied to the threads of screws, will make it easy to drive them into hardwood, or in the case of machine screws, will facilitate driving them down if the tapped hole is rusted.

Cement-Floor Covering to Prevent Dust

If it is desired to make a concrete floor in a factory or mill that will not sand off or make dust, a coating for the purpose can be prepared when making the floor. This coating consists of one part of cement to two parts of crushed rock or hard

gravel, which will pass through a ½-in. sieve, and from which the fine dust has been removed. This is thoroughly mixed in a mixing box, or by a machine mixer, with a sufficient amount of water to produce a plastic but not sloppy consistency, and spread on the under concrete before either the finish or the under concrete has had time to set. It is floated with a wood float to a true level, and then slightly troweled with a steel trowel, to bring it to a proper level and to smooth the top slightly. This will give a finish which is pebbly, and not dead smooth or slick like a sand finish. After the finish has been troweled, and has set sufficiently so that the covering will not mar the surface, it should be covered with sawdust, sand, cloths, or any other material which will hold water continuously. The finish should be kept soaking wet for at least a week, or, better, for ten days.

Half of Large Tank Used for Truck Body

For hauling odd-shaped pieces of iron, such as castings or steel forgings, which cannot be neatly piled on an ordinary truck, a body made from half of a large, discarded tank, has been found highly satisfactory. The cutting of the tank was done with an acetylene torch. Simple blocking keeps the body securely on the chassis and prevents it from rolling.

Useful Truck Body for Odd-Shaped Iron Pieces Can Be Made from Half of Discarded Tank

Tool Made of Steel-Bar Stock

Tool for Removing Terminals from Storage Batteries

For removing terminals from storage batteries quickly and without injury to the battery, the illustrated tool was devised by an attendant in a service station, and was found entirely practical and time-saving. It consists of two hooks and a thrust end for the battery post, the latter being formed on the end of one of the handles, which are made from steel-bar stock, found around the shop. The hooks are pivoted to the handles as indicated in the upper detail which shows all the parts of the tool. In use, the hooks engage on opposite sides of a terminal, while the thrust end bears against the top. Manipulation of the handles forces the hooks up against the terminal, first on one side and then on the other, prying it off slowly.—Geo. A. Luers, Washington, D. C.

Two Harrow Disks on a Wooden Handle Make a Good Tool for Covering Freshly Seeded Rows

Covering Rows of Seed with Dirt

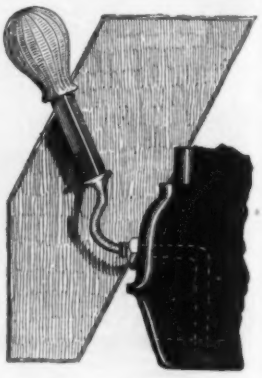
Rows of seeds can be quickly covered with the illustrated tool which was made and used by a Nebraska truck farmer. It consists of a handle cut from a 1 by 6-in. board, 4 ft. long, the corners on the wide end being cut off at an angle, as indicated, and two harrow disks attached by means of suitable screws. Holes should be drilled in the handle to receive the screws, to prevent splitting the wood. Washers are provided on each side of the disks to reduce friction and prevent excessive wear on the wood by the rotating disks. In use, the tool is pulled along over the row so that the disks push the dirt up between them, which leaves a small ridge completely covering the seed. —Dale R. Van Horn, Lincoln, Nebr.

How to Set and Level a Door Jamb

For a 2-ft. 8 in. by 6-ft. 8-in door, make a mark at a point 6 ft. 9⅜ in. above the rough floor and then with a level transfer this point to the other side of the opening. In the same way locate this point on both sides of each door opening to be cased up, using a hand level, straightedge or some other leveling instrument. Then cut the side jambs 6 ft. 8⅜ in. long and case up the sides of the opening, using straight casings. When the side casings are on, set the frame into the opening, holding the top of the casing to the 6-ft. 9⅜-in. mark. This distance will allow ¼ in. for margin, 6 ft. 8 in. for the door, ⅜ in. for clearance, and ¾ in. for finish floor. Nail the casings at the top first, being careful to keep them to the mark. Then, using the casing for a straightedge, plumb the side jambs and finish nailing the casings. The other side casings can now be put on and the work on the opening completed. Before leaving the opening, nail the jamb to the rough work with 10-penny finishing nails, driving them at an angle of about 60°. This slant prevents the jamb from being pulled out of place.—H. H. Siegele, Emporia, Kans.

Hydrometer Syringe Used to Test Auto Oil Line

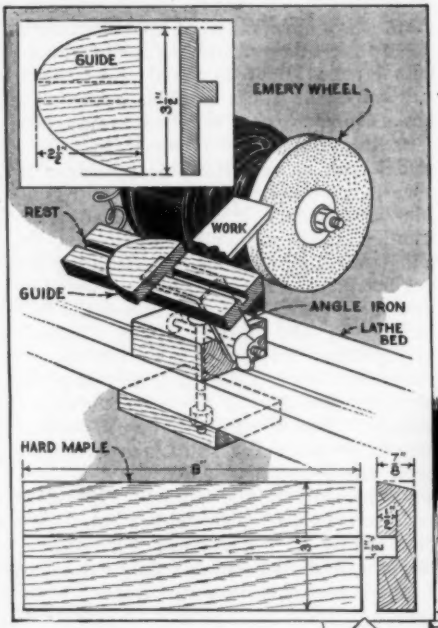
To locate trouble in the oil-circulating system of an auto often is a puzzling job. Air leaks on the suction side of the oil pump will stop the supply of oil. To avoid the trouble of taking down the oil pan, use a hydrometer syringe as shown in the illustration. If the rubber nozzle is too small to fit tightly, it may be wound with tape to make it air-tight. If the line leaks inside of the crankcase, the rubber bulb will expand freely, and if the line is clogged, the bulb will not expand at all. In case everything is in good condition, the bulb will expand slowly and oil will gradually come up inside the glass. The same method may be used to test gas lines, but the capacity of the syringe must be equal to the volume of the parts being tested.—R. Hadley, Fairfield, Conn.



Sliding Toolrest for Emery Wheel

By W. CLYDE LAMMEY

FOR best results, chisels, plane irons and similar tools must be ground to a certain bevel, and the edge must be perfectly square with the tool. The average home mechanic and small-shop owner, who grind these tools on an ordinary hand-operated emery wheel, know how difficult it is to get the edge ground accurately, and will therefore appreciate the sliding toolrest shown in the drawing. With its use the work can be ground to any bevel desired without depending on the accuracy of the eye and the steadiness of the hand. The illustration shows two applications of the tool, one, a lathe-bed attachment and the other an attachment for a hand-operated grinder fastened to a workbench. Essentially the device consists of a wooden toolrest and a small guide sliding in a groove cut across the top of the rest. The adjustable feature of the tool makes it especially valuable, the rest being pivoted to the base, which permits grinding the edge of the tool to any desired angle.



To make a rest of this kind for a hand-operated, 7-in. emery wheel, first remove the iron rest with which the wheel is already equipped. Rip from ⅞-in. hard-maple stock a piece 3 in. wide and 8 in. long. For wheels of other sizes the dimensions may, of course, be changed. Plow or dado a ½ by ½-in. groove in the rest as indicated, and plane one edge off at a 30° angle. Drill the iron rest for screws to fasten the wood rest to it securely, with the beveled edge next to the wheel. A guide made of a ½ by ½-in. strip with a ⅞-in. block nailed or screwed to the end is then made. The edge of the block must be perfectly straight and must be set at right angles to the guide strip or tongue, which must be a close fit in the groove. Use a small square to check for accuracy. Rub paraffin or soap in the groove and over the guide strip in order to prevent binding. In the case of a toolrest designed to fit a lathe bed, the rest is screwed to a flat-iron support, which is bent at right angles as indicated, and is drilled to receive screws, two of which hold it to the rest securely, another one serving as a pivot. Two blocks fitting on and under the lathe bed serve as the base to which the rest is at-

Easily Made Toolrest for Grinding Plane Irons and Chisels Accurately and at Any Desired Bevel

tached, as is clearly shown in the upper detail. A bolt and wingnut are used to clamp these pieces to the lathe bed. In use the rest is first set to the correct angle for grinding the work, which is held firmly on the rest with the thumb and first finger of the left hand, while the other fingers go over the guide. Both the guide and work are slid back and forth as a small cut is taken off along the edge of the tool. The emery wheel is turned with the right hand at a fairly good speed.

Device to Pick Up Articles Saves Back

Stooping over constantly to pick things off the ground is rather hard on the back

Hinged Sticks Make Handy Device for Picking Objects off the Ground

and therefore the device shown in the photo will be appreciated. It consists of two sticks hinged together near one end, and a spring near the hinge to hold the sticks together. Squeezing the handle opens the sticks so that they can be set over the object to be picked up. Releasing the handle allows the sticks to grip the object securely. It was found advisable to provide the ends of the sticks with sheet-metal tips.

How to Eliminate Static Electricity from Moving Belts

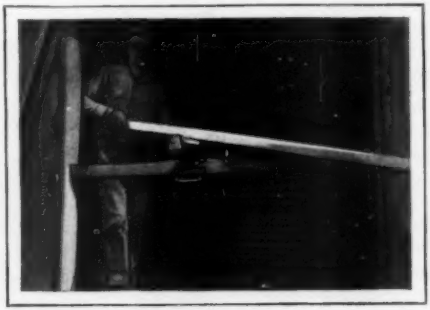
Static can best be eliminated from a moving belt by applying to its surface some material which is a good conductor of electricity. Although the theory is not new, it is a question what kind of material to use for this purpose. Rapidly moving metal parts, such as metal disks, never are subject to static troubles because the disks themselves are excellent conductors. For the same reason, metal bandsaws, which run at velocities of thousands of feet per minute, never give static troubles. Therefore, if a belt is made conductive it will not collect static, but the substance applied must not decrease the coefficient of friction between the belt and the pulleys, must not injure the belt in any way, and must wear well. Experiments with a number of materials for use on rubber belts showed that a good grade of spar varnish was a very satisfactory vehicle. Powdered aluminum, bronze, copper, graphite and lampblack have also been tried, various proportions of each being mixed with the varnish. The most satisfactory results for rubber belts were obtained by using a mixture of lampblack, 18 parts, and spar varnish, 82 parts. For a good non-inflammable thinner, equal parts of carbon tetrachloride and painters' naphtha are recommended. This dressing was carefully tested on belts in actual installations on an air compressor and on a rubber conveyor belt. It was also tried on rubber belts in flourmills and on threshing machines. When it was applied to the entire surface and allowed to dry, static did not develop. The belt should, of course, not be used until the dressing is entirely dry. For leather belts the following formula has been found satisfactory: liquid fish glue, 100 cu. centimeters; glycerin, 88 cu. cm.; sulphonated castor oil, 100 cu. cm.; water, 170 cu. cm.; lampblack, 82 grams, and 2-per-cent ammonium hydroxide, 20 cu. cm. In some instances, it is well to increase the amount of glycerin and fish glue. The material for leather belting may be applied while the belt is moving, but the dressing for the rubber belting must be allowed to dry before the belt can be used.—W. F. Schaphorst, Newark, N. J.

Tapping Soft Materials

Experimental model work frequently calls for tapped holes in soft materials, such as hard rubber, fiber, wood, and the like. In connection with such work, one may make use of what may be called a "lead" plate. By its use, remarkably clean and accurate threads can be cut with an ordinary tap, even in such material as pine wood. The lead plate is nothing more than a small piece of metal, such as brass or steel, in which a hole of the desired size has been tapped. It should be of sufficient thickness to accommodate about three or four threads. In operation, the lead plate is laid over the hole to be tapped and is held in place with the fingers while the tap is revolved through it into the soft material below. Inasmuch as the feed is thus automatically assured, the threads will come out clean and true. When one has occasion to thread very small holes, the tap can be dispensed with and the screw itself can be made to cut its own thread by screwing it through the lead plate in the same manner as is done with the tap.—August Jeffers, Bedford, Ind.

Roller Helps Load Lumber in Box Cars

Loading box cars with lumber can be done easily and quickly by using the pivoted roller shown in the photo. A piece of heavy flat steel is bent at right angles to form a wide "U," and the ends are drilled to serve as bearings for the roller shaft. A hole is also drilled through the center part of the roller support, which is pivoted by means of a bolt to a 4 by 4-in. beam as indicated, a jack screw on the end of the beam permitting it to be wedged securely in the doorway.—C. Groat, Portland, Oreg.



This Pivoted Roller Lightens the Task of Loading Lumber into Box Cars

¶To stop a dripping faucet until a plumber can be called, get a rubber band, at least 1 in. wide, and stretch it over the spout and handle.

Air Bucker Used in Riveting Can Be Suitably Adjusted under Heavy Tank with Wood Blocks

Adjusting the Air Bucker-Up

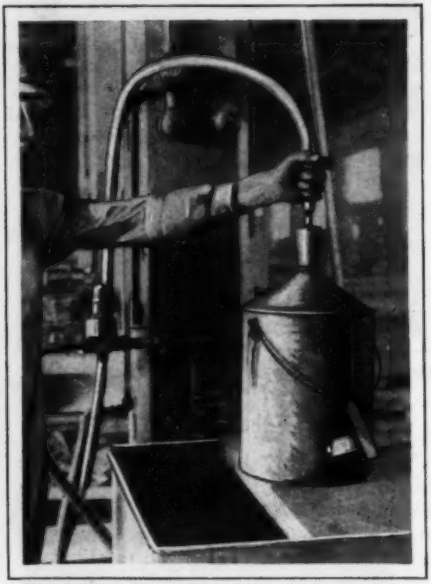
When riveting heavy material, where bucking-up must be done from below, an air bucker, with a piston range of 7 or 8 in., will be found a great help. By using several lengths of metal pipe to slip over the bar of the bucker, setting the lower end of the pipe on a wood block, its elevation may be regulated to suit the height of any rivet, on oval surfaces like that of a boiler.—Jos. C. Coyle, Denver, Colo.

Saving Electric Light in the Stock Room

A toggle switch, arranged so that the opening and closing of a stock-cabinet door would turn the light on and off, resulted in a considerable saving of current. The arrangement was found successful in a printing shop, where the stock cutter, with both hands full of paper, rarely, if ever, stopped to turn the snap switch, but always pushed the cabinet door closed with his foot, switching off the light that formerly burned unnecessarily.—E. Sherman, Tucumcari, N. M.

Testing Metal Cans for Leaks

In a Denver establishment, where metal cans are manufactured, tests for leakage



Tapered Rubber Nozzle Admits Air to Cans When Testing Them for Leaks

are made by filling the cans with compressed air and then submerging them under water. The air is admitted to the can by means of a cone-shaped rubber nozzle, 3 in. long, 2 in. in diameter at one end and ⅞ in. at the other. A ⅛-in. nipple is passed through the center of the nozzle to allow easy attachment of the air hose. Owing to its taper, the nozzle can be quickly fitted into any circular opening from ⅞ to 2 in. in diameter.—J. C. Coyle, Denver, Colo.

Expansion and Contraction of Wood

One of the most serious drawbacks to the use of wood for accurate work is its susceptibility to moisture. The sap cells absorb moisture in damp weather and the wood swells, while in dry weather the moisture is drawn out and the wood contracts. This expansion and contraction is practically all in the direction running crosswise to the grain. Woods ordinarily swell ten times as much crosswise as lengthwise. Knowing this, the user should arrange his structure so that changes come in the least important sections. Pacific coast redwood is an exception to the above rule. It expands just about as much lengthwise as the other way and for that reason it is undesirable for most uses.—Donald A. Hampson, Middletown, N. Y.

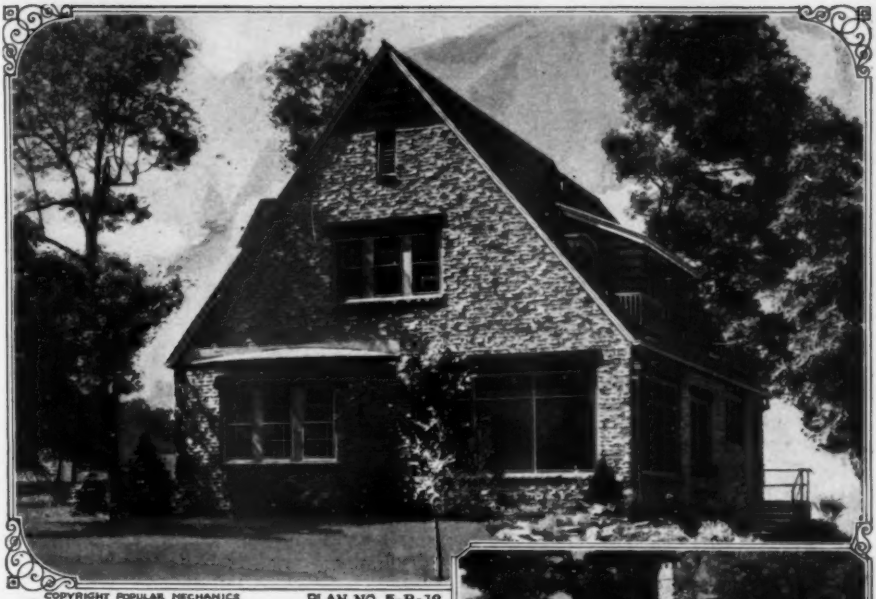
Efficient Guard for a Saw Trimmer

An ordinary shower-bath curtain was made into a satisfactory inclosure for the saw trimmer, to prevent metal chips from flying about the shop, in a western printing plant. A large ring of heavy iron rod was hung from the ceiling, high enough to allow plenty of room for the worker using the saw to stand under it. From this ring the curtain was suspended by means of the ordinary brass rings, so that it extended about 18 in. below the level of the saw mandrel. A quick jerk on the curtain closes it around both the saw and the worker. When not in use, the curtain is pushed to the rear or one side of the saw.—Edgar Sherman, Tucumcari, N. M.

Canvas Top for the Tractor

Driving a tractor in the rain is not a pleasant task, but the situation can be improved by providing a canvas top like the one shown in the photo. The frame is made of pipe and fittings or iron rod, and the canvas is cut and sewed together to fit over it snugly. Celluloid windows sewed into the canvas give sufficient vision.—Carlton Groat, Portland, Oreg.

Canvas Top with Celluloid Windows Protects Tractor Driver during Rain



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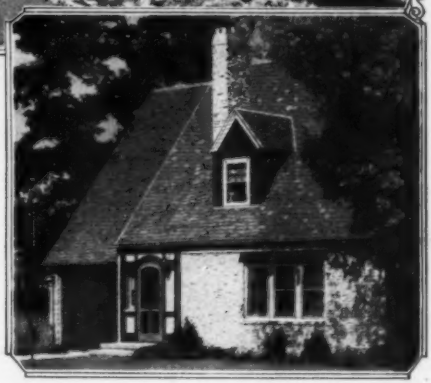
They Said It Couldn't Be Done



WHEN Chicago architects, several years ago, asked Chicago brick layers to build walls of common brick skintled-fashion, many refused because they said it was not brickwork. It was at variance with habits of years of bricklaying.

But the architects were insistent. And today both Chicago architects and bricklayers can claim a large measure of credit for developing a new idea—skintled brickwork—out of an old material. At the same time they have made an aristocrat out of a product which for many years had been used for the more common everyday structural purposes, such as rear and sidewalls.

Common brick now face the street in fine residence jobs. The endless skintle variations produce a charm of wall texture and newness of style quite different from anything we have had before. Furthermore, such walls are relatively inexpensive. So much so that this new treatment is becoming very popular in small houses.

There are no definite rules for laying skintled brickwork. The idea is to produce an irregular surface or facing in which the brick, unevenly laid in the wall, sometimes project at one end as much as an inch. No

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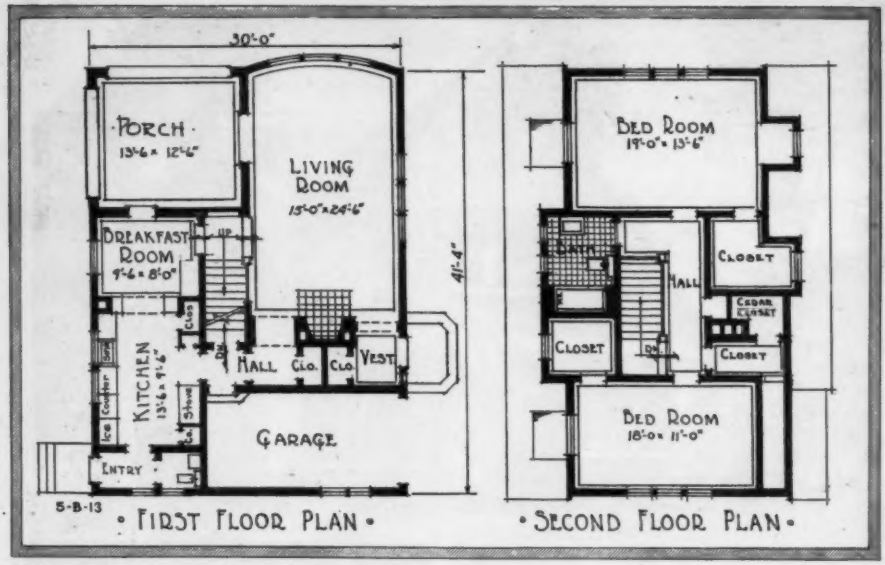
To help our readers get started on one of life's most glorious experiences—building and owning a home—Popular Mechanics Magazine will supply readers a one-sheet blueprint of any house appearing in the magazine for $1. This blueprint does away with the necessity of first purchasing a complete set of plans to find out whether you can afford to build. It contains floor plans, elevations, a section detail, size of joists, studs, etc., and also a brief specification. Submit it to tradesmen and dealers for building estimates.



definite pattern is followed, save perhaps some particular bond such as Flemish, English or Dutch. The only idea is to obtain a sense of extreme irregularity or texture, which in itself becomes tremendously appealing. The projections of the brick cast shadows on the wall surface. These shadows give what architects call a play of light and shade or decorative effect.

Aside from common brick, laid skintle-fashion, you find salvage brick used in the same manner. What is meant by salvage brick? Brick selected from old buildings, being torn down. Many are weatherworn but still in excellent condition, and when used in a skintled wall, produce original and colorful effects.

What about the cost of a brick house? Manufacturers say that costs have been brought down until today, with certain types of wall construction, the brick house will not cost over six per cent more than a frame house. They also add that the moderately increased first cost for brick is soon offset through savings made in annual upkeep, such as painting, insurance, etc.

A word of advice about selecting brick for your house. Don't try to judge a finished wall by a few loose bricks. Remember that the mortar joints are almost as important as the brick itself. So, if possible, select your brick from a group of wall panels. These are on display in most dealers' offices. Try to picture your completed house done in brick and appropriate mortar joints before you place your order.

The house illustrated this month is a common-brick skintled job done uncommonly well. The owner says the final cost was not more than $400 over and above frame construction.

In this house a built-in garage opens onto a rear hall. The hall is a pivot around which radiate the service and living quarters of the house. A large living room is a feature. The adjoining sunporch adds more room to the living area. On the second floor there are two good-sized bedrooms and an abundance of closet space. You have here a small house of reasonable cost that departs sufficiently from standards to make it individual and of excellent resale value.

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